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ON THE

## SURGICAL PATHOLOGY

OF THE

# LARYNX AND TRACHEA,

CHIEFLY WITH A VIEW TO ILLUSTRATE THE AFFECTIONS  
OF THOSE ORGANS WHICH MAY REQUIRE THE

## OPERATION OF BRONCHOTOMY:

INCLUDING REMARKS ON

CROUP, CYNANCHE LARYNGEA, INJURIES BY  
SWALLOWING ACIDS AND BOILING WATER,  
FOREIGN BODIES IN THE WINDPIPE,  
ASPHYXIA, WOUNDS, &c.

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AS A  
GRATEFUL ACKNOWLEDGMENT  
OF  
NUMEROUS AND PERMANENT OBLIGATIONS,  
THE FOLLOWING PAGES ARE  
INSCRIBED TO  
PHILIP CRAMPTON, ESQ.,  
SURGEON GENERAL,  
&c. &c.;  
BY HIS FRIEND AND PUPIL,  
THE AUTHOR.







## INTRODUCTION.

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THE first edition of this work was published at the request of several students ; and the reasons that induced the Author, then a comparatively young and inexperienced practitioner, to comply with their solicitations, were fully explained at the time. They may be shortly enumerated as follow: viz.— First, The want of any continued and detailed account of the operation of Bronchotomy, and the causes that may render its performance necessary; for, although abundance of valuable information on these subjects exists in the works of different authors, and more particularly in various periodical publications, yet the labour of research, and of collecting and arranging and reconciling different opinions, is more than ought to be expected from a student, or than he could by possibility succeed in. Secondly, The total absence of pathological facts and observations; and, Lastly, That which might be considered as a necessary consequence, the indecision and uncertainty that prevailed in the treatment of these cases. In fact, the operation of Bronchotomy was, and perhaps is still, too often a matter of experiment, resorted to for the purpose of giving a patient a chance of life when every other remedial measure had been tried and found unsuccessful. Indeed, to a certain extent this is unavoidable; for the pathology of the Larynx and Trachea, however improved, is still imperfect, and many cases occur that baffle our expectations and disappoint our preconceived opinions: yet must the attempt to arrange the diseases of these



organs into pathological order, and explain the peculiarities observable in each, prove useful; for it is only on such a basis that scientific surgical practice can be established. Every mode of treatment, however successful, every surgical operation, however splendid in its results, if undertaken on other grounds, can only claim the praise of fortunate empiricism.

Perhaps, of all the operations in surgery, Bronchotomy is the one which in its nature and results has been least understood both by the profession and the public. As to the causes that render it necessary, and the time when it should be performed, the opinion generally inculcated is, that in any case where it is likely to prove necessary, the earlier it is performed the better; and the records of surgery shew that many individuals who were suffered to perish in a miserable state of suffocation, might have been thus preserved. But the practice is not that which should follow from such doctrine. Useless and unavailing efforts are made to check a disease too often uncontrollable: time is frittered away that cannot be recalled; and the operation is resorted to when it comes too late, and must, of necessity, prove a failure. Again, the necessary consequences of the operation, and the dangers attendant on it, are not truly estimated: many considering it almost as easy in performance and as free from peril as a common bleeding; whilst others attach to it a degree of importance and of hazard to which it is as little entitled. Amongst the public there is a prevailing notion, that wounds of the windpipe must necessarily prove fatal. This idea may possibly be traced to the older writers on surgery, where such a doctrine is almost universally inculcated; and, perhaps, is partially derived from observing the deaths of slaughtered animals, where this tube is wounded, and what is manifestly the effect of loss of blood is erroneously attributed



to another cause. This view of the case renders a patient unwilling to submit to the operation as long as the disease is tolerable—that is, as long as success is possible. He then calls for it—it is performed—and he dies: an event which is, usually, by his friends attributed to the operation. Under such circumstances the surgeon will hesitate to propose or to press a similar mode of proceeding in similar cases; and thus has one of the simplest and safest operations come to be regarded as desperate or uncertain, dreaded by the public, and not sufficiently supported by the profession. Within my own experience, I have seen many cases, that might have been saved by operation, suffered to perish through the influences of these causes—causes that can only be removed by the establishment of correct ideas as to the pathology of the organ.

During the last ten years I have had very considerable experience in affections of the Larynx and Trachea, and have, in some instances, been enabled to extend the pathological views I had previously entertained; in others, I have been induced to modify or even to change them. About the period alluded to, the stethoscope was but coming into use, and its application to the discovery of certain conditions of the aërial apparatus, if not unknown, at least had not been demonstrated in this country: its utility, however, has been since completely shewn; and it will be seen in the following pages, and more particularly in that section which treats of foreign bodies in the Larynx and Trachea, that it is capable of affording certain evidence of the existence of a condition of parts that before could only have been conjectured by rational, and therefore fallible signs. Under these circumstances, I have not only introduced some subjects that were not discussed in the former edition of this work, but have been obliged to extend and to modify the descriptions

of symptoms, so as to make them accord with the present state of our knowledge. In some instances, I have written entire sections anew. In the pathological observations, and in the practical deductions drawn from them, I have seen but little occasion to make alterations; at the same time it must be confessed, that one or two important points were overlooked, or not dwelt on with sufficient force: in particular, the co-existence of disease of the Lung with that of the Trachea, a complication that often renders the best-conceived and best-executed operations abortive.

With respect to the operation of Bronchotomy, as applicable to the treatment of laryngeal disease, the opinions I formerly ventured to publish have now become authority, since they were adopted by the late Dr. Cheyne, and quoted by that talented writer and accomplished physician, in the articles "Croup" and "Laryngitis," in the *Cyclopædia of Practical Medicine*. The approbation of such a man is the surest criterion of successful authorship, and the most gratifying reward that could attend a writer's labours; I have, therefore, not attempted any alteration in that part of the present work. On the whole, I have endeavoured to render this Treatise on Bronchotomy as extensively and as practically useful as my experience would permit; and I offer it to the profession with the more confidence, that my former humble contribution to pathological science was so kindly and so favourably received.



# OBSERVATIONS,

&c. &c.

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Introduction—Diseases of the Larynx obscure—Pathology of mucous Membranes—Inflammation—Inflammation of submucous Tissue—Œdema—Effusion of Lymph—Hæmorrhage—altered Secretion—altered Sensibility—Function of the Membrane impaired—Ulceration—Mortification—Spasm.

AS the larynx and trachea possess an internal covering of mucous membrane, the morbid affections of these organs must be influenced to a very considerable extent by the effects produced by inflammation on this particular structure. Previously, therefore, to an examination of the nature of the derangements found here, and the symptoms by which they are characterized, it may not be unprofitable to take a brief survey of the phenomena attendant on inflammations of mucous structures in general, and of the consequences resulting from them. A knowledge of the changes of structure produced by disease—of the varieties developed by age, climate, and habits of life; and of the deviations from its natural progress arising in particular constitutions, often from the influence of accidental circumstances—is eminently necessary to the practitioner who would understand his profession rationally and scientifically. The symptoms of disease may advantageously admit of division into two great classes; 1st, Those arising from the presence of any morbid action in a particular structure, which are peculiar to that structure, and found to exist in it, under similar circumstances, in whatever part or

situation of the body it may be placed ; and, 2dly, Those occurring in consequence of an organ being no longer in a fit condition to perform the functions for which it was originally intended in the animal economy. The symptoms that result from an interruption or cessation of function are in general soon discovered, and very easily discriminated. A man who finds his respiration become painful and difficult, quickly apprehends that something is the matter with his lungs or his windpipe ; but he may have a dryness and huskiness of the throat, a tickling cough, an expectoration of mucus, or even of a muco-purulent fluid, without his attention being strongly attracted to the subject, or his suspicions being awakened to the perilous nature of his disease.

In those forms of disease, also, wherein a surgeon may be tempted to undertake an operation in the hope of being enabled either to prolong or preserve the existence of his patient, it must be of importance that he should be aware of the condition of the parts with which he is about to interfere. Few circumstances tend more directly to diminish professional reputation, or the confidence the public should be encouraged to repose in the efforts of art, than the performance of unsuccessful operations ; not of operations hazardous in their nature, and uncertain in their results, but those which are undertaken for the relief of incurable disease, and in which, of course, success must be impossible. Next to this class of operations might be ranked those undertaken with a view to give the patient a chance of life, when every other effort has failed ; which are begun in uncertainty, conducted with timidity, and most generally end in disappointment. It must not be understood, however, that I would object to the performance of an operation in a case where the patient must otherwise inevitably perish. The



infliction of a little additional pain is but of trivial consequence when weighed against even a feeble hope of recovery; and in the event of a patient's death it often affords the melancholy consolation that every possible effort had been made to save him; but still those operations which depend upon chance are not such as the surgeon who values his reputation would wish either to advise or to perform. A man should endeavour to make himself acquainted with the effects of disease: he should know the symptoms that mark its progress, and be able to say when the knife of the operator may be used with advantage, and when it should be laid aside for ever. He should be familiar with those new formations and organic changes of structure, that, being hopeless and incurable, ought not to be interfered with; and, taking nature as his guide, he should as firmly decline an operation when he thinks it likely to prove unsuccessful, as he should press its performance under more favourable circumstances.

Perhaps there is no class of diseases involved in greater obscurity, or presenting greater difficulty to the practitioner, than those affecting the Larynx and Trachea. The functions of these organs are few and simple. They serve to transmit the air in the acts of inspiration and expiration, and in them the voice is formed and its tones modulated: the symptoms, therefore, derivable from an interruption or imperfect performance of these functions can be only hoarseness, a loss of voice, and respiration more or less impeded. But every practitioner knows how inadequate these circumstances would be to the formation of a diagnosis between the diseases of the respiratory tube. A man of experience may distinguish between the sibilous breathing that attends laryngeal obstructions, and the raucal sob so frequently met with in severe bronchial inflammations; he may

be familiar with the peculiar ringing of a croupy cough, or with other phenomena only to be learned by actual observation: but when he meets a case of laryngeal disease, how is he to know whether it is caused by an œdematous condition of the submucous tissue—by a chronic thickening of the mucous membrane itself—by laryngeal ulceration—by destruction of the cartilages—by the presence of abscess or tumour—or by any other of those numerous affections which dissection so frequently shews us to be the occasions of death? Perhaps, by reason of the difficulty of the subject, it will be long before the same accuracy of information with reference to the affections of the windpipe can be attained that is possessed in other diseases; but if ever the subject will admit of clear and simple arrangement, it can only be looked for as the result of pathological investigation—a branch of professional study only recently begun to be cultivated with industry and success, and to which, perhaps, the rapid progress lately made in medical science is mainly to be attributed.

In these preliminary remarks, which are only intended to illustrate the nature of the morbid affections observed in the larynx and trachea, it cannot be expected that I should enter at large into an explanation of all the phenomena resulting from inflammation of mucous membranes. The limits I have prescribed to myself would be insufficient for such a purpose, and it would distract the reader's attention to find a number of pathological facts piled together, without reference to any practical end. But I by no means wish to be confined to those organs alone; for the appearances of disease, even within them, may often be more easily and more familiarly explained by reference to a similar structure in a different situation: and as my sole object is to facilitate the student's progress in the investigation



of laryngeal disease, I may be permitted to take that path which I believe will offer the fewest impediments to the completion of my views.

When a mucous membrane is examined in a state of recent inflammation, its colour is found to be greatly increased in intensity, varying, however, according to the violence of the disease and the situation of the membrane. It is more vascular when it is in connexion with soft parts than where it lies against bone or cartilage; and therefore the former exhibits a degree of redness almost approaching to purple, whilst on the surface of the latter numerous small vessels are seen wandering like those on an inflamed conjunctiva, when the affection is not severe. In a case of bronchial inflammation, that part of the mucous surface covering the posterior membranous portion of the trachea is often of a bright blood-red colour, gradually mellowing to a pale pink tint towards the front of the tube, whilst that covering the cartilaginous rings is sometimes nearly white. An inflamed tonsil shews the appearance of inflammation of this membrane extremely well, during life; but if the anatomist wishes to examine this structure after death, he should do so immediately; for the red appearance is either lost or greatly diminished after the lapse of a few hours, and injections afford but an indifferent representation, as during life the membrane is of a much deeper colour than vermilion can impart. Besides, coloured injections do not exhibit that variety of tinge observed in mucous inflammations, but resemble extensive ecchymoses rather than the natural appearances of disease.

Mucous membranes, when inflamed, are swollen, and soft, and pulpy. The surface of the membrane itself appears thickened, and wherever it is villous or flocculent those particular charac-

ters are more prominently developed. But the tumefaction of mucous membrane depends more on the submucous tissue than on any diseased action in itself. This tissue is reticular membrane, exceedingly short and close wherever a mucous surface is laid upon bone or cartilage, but much looser and more relaxed where it is connected to muscle, or to other soft parts. This particular structure seems to have been made the connecting medium between mucous membranes and the adjoining tissues, for the purpose of guarding against any accumulation of fat which might possibly block up the canal, and prevent the passage of those substances to which nature intended they should serve as channels of conveyance. When inflammation occurs in this reticular tissue, the result is an effusion of serous fluid, giving to the mucous membrane that soft and pulpy appearance already remarked, and which, in some instances, is of such importance as to form the prominent and dangerous character of the disease. The tissue connecting mucous membrane to bone or cartilage is so short and close, that there is no room for any infiltration that might prove detrimental. In the looser organs, although the same tissue may be capable of containing a larger quantity of fluid, yet the canal admits of considerable dilatation, and there will not be any great probability that a serious obstruction should be created. But where the mucous membrane is connected to soft parts, and these again are so restrained by the neighbourhood of others more unyielding, that if tumefaction takes place the swelling must press into the cavity of the canal, there is then danger; and it will be proportioned to the natural calibre of the passage, the consequent likelihood of its becoming obstructed, and the importance to life of the substances intended to pass through it. This latter case is well exemplified in the œdematous affection of the larynx, where in the course of a few hours that portion of the membrane near to



the rima glottidis and ventricles will become so puffed up as absolutely to cause suffocation, whilst between the cricoïd cartilage and the membrane lower down scarcely a drop of fluid shall appear to have been effused. This species of œdematous swelling is also well shewn in inflammations of the bronchial membrane; for the surface of the trachea in those cases will appear slightly corrugated, from the tumefaction of the cellular tissue connecting the membrane to the inter-cartilaginous spaces, whilst that covering the rings remains comparatively close and unaffected.

It sometimes happens that lymph is found effused on an inflamed mucous surface, but, *excepting in cases occurring under the age of puberty\**, it is very doubtful whether this substance, considered as the product of *acute* inflammation, be coagulating lymph or inspissated mucus. Occasionally white streaks, resembling lymph, are found marking the tonsils like a snail-track, and patches of a similar nature are discovered in bronchial inflammation, particularly in the vicinity of the ventricles of the larynx; and I have seen a similar substance in the nostrils,—in different parts of the intestinal canal,—in the urinary bladder and urethra; but perhaps these adventitious substances should rather be considered as mucus than as lymph produced by inflammation. Something exceedingly resembling this viscid substance has been found on the fauces and coating of the stomachs of hydrophobic and tetanic patients, and which probably may afford some explanation why the most powerful and active medicines have so little effect on these diseases; but no anatomist ever spoke of this as lymph, and perhaps it would

\* There is a case in the Edin. Med. and Surg. Journal for Oct. 1824, in which croup is stated to have occurred in a patient aged 31 years; but, as he recovered, the identity of the affection with genuine croup may admit of doubt.

be more correct to describe all the viscid tenacious productions of inflammation of mucous membrane in the adult as consisting of inspissated mucus. But in more chronic affections membranous layers of lymph are often formed; as, for instance, in the bronchial cells, where, from taking the shape of the parts in which they are deposited, they appear ramified like the branches of bloodvessels, and were of old supposed to be portions of the pulmonary artery. These are called bronchial polypi, and are generally found in patients of an advanced age. But the best example of lymph being produced by chronic inflammation is to be found in dysenteria tubulosa, where whole rings of a considerable length come away, and this so frequently, and to such an extent, as to give rise on some occasions to a supposition that they were large portions of the mucous membrane reduced to a state of slough, and thrown off by the efforts of nature.

But, in the child, there can be no doubt that lymph is the genuine product of active inflammation of the mucous membrane, although it would appear that the inflammation occasioning it is of some peculiar or specific character, and confined in this particular effect to the larynx, trachea, and bronchial tubes. Even in these situations the membrane may be affected without a deposition of lymph, for in the whooping-cough there is good reason to believe that it is more or less inflamed, and yet rarely is there an adventitious membrane formed; and I have seen cases so far resembling croup in all their stages, that they could not be distinguished from it, in which dissection, after death, shewed the mucous membrane swollen and soft and pulpy, with copious submucous effusion, yet without the formation of a single flake of coagulating lymph. But, generally, inflammation of the larynx and trachea in the child is followed by the pro-



duction of an adventitious membrane constituting the disease called croup. This is of a pale yellow colour; viscid and tenacious; more generally found in the larynx than in the trachea; seldom occupying the entire circumference of the tube; unorganized; incapable of becoming the medium of union, and with a strong disposition to separate from the surface on which it was originally formed. It usually commences in the larynx, and travels downwards along the trachea; more rarely it seems to begin in the ramifications of the bronchial cells; and again still more seldom is the entire of the membrane seized at once, and the adventitious substance thrown out over its entire extent\*.

Soon after the lymph has been secreted, the appearances of inflammation in the membrane subside. It has no longer the swollen pulpy appearance, and it loses its blood-red colour. The lymph now separates and becomes an extraneous body; and portions of that formed in the larynx are coughed up, whilst lower down in the trachea it is strongly adherent, and other parts of the tube are only commencing the process of inflammation, which in its turn is to terminate in a similar result. If the disease is circumscribed and has subsided, the lymph is sometimes expelled by coughing, and a few cases of croup have thus terminated favourably when such a result was the least to be expected. But, on the other hand, this loose and floating substance has been thrown by the violence of the cough against the rima glottidis, become entangled there, and caused the death of

\* In an inaugural dissertation published by a German physician of the name of Schmidt, there are some experiments to prove that artificial inflammation excited in the windpipes of animals *only produced the adventitious membrane in those very young*; whilst every attempt to create it in the old proved abortive.

the patient by instantaneous suffocation, at a period of the disease and under circumstances otherwise promising a speedy recovery.

Another common occurrence connected with inflammation of mucous surfaces, is hæmorrhage without any apparent abrasion or lesion of the membrane. In some of the severest cases of dysentery little more has been discovered than an ecchymosis under the mucous structure, with an effusion of blood into the intestine. Epistaxis is a frequent accompaniment of common catarrh; and hæmoptoe by no means rarely to be met with in inflammations of the bronchial membrane, where it is not at all so perilous a symptom as is generally imagined. If blood is expectorated florid and frothy, the great probability is, that it comes from some wounded vessel of the lungs; but if it is darker coloured, small in quantity, and mixed in streaks with mucus, it will be more readily supposed to be poured out from the mucous surface, and is an index of the existence of inflammation therein. Hæmorrhage from these surfaces is found to occur under two very opposite conditions. One in a chronic state of disease, when the vessels are relaxed and the constitution sinking under debility, as the flow of blood from the intestines in the last periods of typhous fever, and the bleeding from the surface of the bladder in broken-down old men: and another in the more active forms of inflammation, where the vessels are overloaded and distended, and pour out their contents merely as an effort of Nature to relieve herself. These latter forms of hæmorrhage are rather to be considered as favourable symptoms than otherwise.

With respect to the natural secretion of mucous membranes, it is usually supposed to be increased in quantity and so altered in quality, as in all its characters, both sensible and chemical, to



resemble pus. Already we have seen that some affections of this structure are not productive of this result, inasmuch as they lead to the formation of an adventitious membrane; but besides, it is only in some situations that the existence of purulent matter can be clearly demonstrated, whilst in others it is doubtful, and in some others still, its non-appearance will admit of proof. Inflammations of the genito-urinary system produce the best specimens of purulent discharges without loss of substance, and, next to them, those of the pulmonary. It is questionable whether the organs concerned in digestion ever pour out matter unless when actual ulceration is present, and the mouth, fauces, œsophagus, and perhaps the Schneiderian membrane, never exhibit this symptom; at least, if they do, it has never fallen under my observation.

In reference, however, to the larynx and trachea, it is certain that inflammation will produce purulent expectoration. Far, however, from this secretion being in itself a dangerous symptom, its appearance usually indicates the subsidence of the first inflammatory action; for it is when the vessels have begun to unload themselves, when the intense redness has disappeared and the swelling subsided, that the purulent discharge appears to flow from the surface of the membrane. It would, in fact, be always a favourable symptom, except that mucous surfaces, when once they have taken on any particular action, have a strong disposition to continue it to an indefinite period. Gleety discharges form a good illustration of this tendency to the maintenance of a morbid action; and gleets from the pulmonary membrane would perhaps prove as trifling, and afford as little trouble as those in any other situation, if it was not that the efforts to expectorate the secretion through the narrow aperture of the larynx very constantly produce such derangements in the lungs

as to cause the most formidable symptoms and often a fatal termination. Indeed, previous to the use of the stethoscope it was often extremely difficult to distinguish between the protracted chronic forms of bronchial inflammation and regular phthisis arising from tubercular suppuration, for both diseases exhibit the cough, the nocturnal perspirations, the difficulty of lying on one particular side, and the purulent expectorations. And the similitude may be carried farther; for both very commonly have a like termination, the one dying from an accumulation of the secretion which the patient has not strength to expectorate, the other of the suppuration and destruction of the organ, as is observed in tubercular phthisis pulmonalis.

A very common consequence of inflammations of mucous membranes is, that their sensibility is so altered that they ill endure the presence of those substances, for the transmission of which the organs of which they form a part were originally intended, and they certainly do not operate on them those changes usually performed during health. If the lining membrane of the bladder be inflamed, the viscus will not contain a drop of urine even for a moment, and the patient is perpetually teased with the most urgent calls to expel this fluid. If the urethra be the seat of disease, the passage of the urine over the affected spot causes a sensation of burning pain that is almost intolerable. If the stomach is attacked, not only is the presence of food within it painful and disagreeable, but vomiting is a symptom constant almost without an exception: and it is well known if the intestines are inflamed, as in acute dysentery, that the smallest quantity of mucus is so painful and so irritating, that the patient is frequently called upon to discharge it. In applying this pathological observation to the membrane covering the larynx and trachea, two facts of some importance come



before our notice : First, that the passage of the air is more or less accompanied by pain; for at every inspiration the patient shews evident symptoms of suffering, although his anxiety to inflate his lungs, and the horror that always accompanies the dread of suffocation, make him forget the actual uneasiness, in his struggles to procure a sufficient supply of air. And, secondly, that in acute cases of bronchial inflammation, the arterialization of the blood is but very imperfectly performed.

Whatever the part may be which the bronchial membrane has to perform in the act of respiration, as connected with the change wrought upon the blood in the lungs, it appears very probable, if not certain, that the function is so deranged by inflammation, that very often the occurrence of death can only be explained by this circumstance. It may be easily supposed, that if the surface of the membrane is covered by any adventitious substance, whether a layer of inspissated mucus or of effused lymph, or if the bronchial cells be filled with serous fluid, the interposition of these may prevent the contact of the membrane with the air, and thus produce fatal consequences. But, in numerous dissections after death, no such extraneous bodies have been discovered, and the subjects have appeared to have died because the blood could not undergo that change which is essential to the maintenance of life. It is also remarkable, that cases of very acute bronchial inflammation are rapid, if not sudden, in their termination. Sometimes, it is true, the patient perishes in consequence of a rupture of some of the air vessels of the lungs, caused by the violence of coughing, and the organ thus becoming emphysematous, and incapable of performing its office. Sometimes, perhaps, and particularly in aged subjects, a vessel of the brain may give way from a similar cause. On other occasions the mucous membrane is found

partially smeared over with a substance resembling thin paste or honey, which might slightly interfere with its healthy functions; but in the great majority of cases I have had an opportunity of examining, the mucous surface appeared red, swollen, and pulpy, rather exhibiting a deficiency of its accustomed secretion, and unaccompanied by any other morbid production, unless a small quantity of serous effusion in the bronchial cells. This serous effusion I have just now noticed is found in greater or less quantity in all subjects that have died by obstructed or imperfect respiration, and has by some been considered as the ordinary product of inflammation of mucous membrane. But, independent of the circumstance that such fluid is not observed to be poured out by mucous surfaces in other situations, it is easy to account for its presence on other principles more consonant to the phenomena resulting from disordered breathing. Whenever, either by reason of an insufficient supply of air or of the presence of inflammation in the membrane, the blood is but partially or imperfectly arterialized, congestion within the lung is the consequence, and the vessels, to relieve themselves, begin to pour out their serous contents. If the original cause be longer maintained, the heart is obliged to supply the brain with a fluid inadequate to maintain its healthy tone and actions; and the nervous influence imparted to the whole body, and of course to those parts concerned in the important process of respiration, being impaired, the lungs become still more loaded, and the effusion is continued and increased. Finally, the energy of the brain fails, and the muscles of respiration cease to act: and thus the patient dies, not because an effusion of serum into the bronchial cells had caused suffocation, but because inflammation had prevented the arterialization of the blood, and thus deprived the brain of that stimulus which is necessary to the maintenance of its healthy actions. As a proof that serous ef-



fusion is only a secondary result of this species of inflammation, it may be observed, that in all cases where the respiration has been long obstructed, and the progress of the disease tedious, the quantity of fluid thrown out is very great, often so abundant as absolutely to fill the trachea; whereas if the disease has been rapid, and consequently the congestion but of short continuance the effusion is seldom more than trifling.

Ulceration is an exceedingly frequent consequence of inflammation in mucous structures, but less so in the larynx and trachea than in other situations, although it is occasionally discovered here under particular circumstances. The appearance of ulcers here are sometimes irregular and anomalous, particularly if connected with syphilis or other specific taint; but, generally, they assume such peculiar and distinctive characters as to render their classification easy. We find three forms of ulceration to prevail on mucous surfaces. First, immediately at the apertures of these canals where the membrane runs into and becomes identified with the cuticle, ulceration assumes the appearance of a ragged crack, which spreads irregularly, scabs, and finally heals without granulation. The second is that known by the name of the aphthous ulcer, a small circumscribed sore, either of an oblong or circular form, its edge red and slightly elevated, and its surface covered with a strongly adherent slough. This ulcer is rarely the result of acute inflammation, and may be regarded as sympathetic, indicating the existence of irritation in some distant part of the canal, as in the examples of aphthæ occurring in the mouths of young children, apparently in consequence of some diseased action being present in the digestive system. They also appear not to heal by granulation, but by a gradual contraction and approximation of the edges of the sore. The third is, perhaps, the most important form in

which ulceration appears on mucous surfaces. Then we have a broad, flat sore, sometimes deep, sometimes superficial; its surface covered with a tenacious slough of a bright yellow colour, and its edges uneven, if not ragged. These sores have a wonderful disposition to spread, and frequently we see them rapidly making way in one direction, whilst they are healing just as rapidly in another. They are often met with on the surface of the intestines of scrofulous children, but their most frequent situation is in the throat, where, commencing at the back of the pharynx or on the edges of the arches of the palate, they spread downwards to the larynx, and produce the most formidable consequences. The soft palate is often altogether destroyed by them, and perhaps, after continuing during an immense length of time, and resisting every application and all kinds of medical treatment, they seem to heal spontaneously; but in general their termination is not so favourable. I believe they are most commonly fatal; but death is not induced either by the irritation they create or the ravages they commit, but by the general constitutional derangement to which they owe their origin, and of which they may be considered in the light of symptoms. The most perfect specimen of this form of ulceration I ever witnessed was in the case of a man who died of laryngeal disease in the Meath Hospital. He was of a highly scrofulous disposition, had contracted a venereal taint, and taken mercury irregularly, so that he seemed to have suffered from a combination of morbid excitements at the same time, under which his health rapidly broke down. On examination after death, a number of broad, flat, irregular ulcerations were found in the œsophagus, with ragged, uneven edges, and their surfaces covered with a tenacious matter of a bright gamboge-yellow colour.

The appearance of sloughs on the surface of mucous mem-



branes is far from infrequent, and they may be the results either of accident or disease; the swallowing of boiling water, or any of the strong acids, furnishing an example of the one, and the malignant sore throat attending on scarlatina of the other. The colour of the slough is grey, or ashy: in some few cases it appears brown; its edges are abrupt and well defined, and it is surrounded by inflammation of an intensely deep red colour, amounting almost to purple. It is in general slow in separating, and, when thrown off, it appears to resemble a membrane of viscid lymph not unlike the adventitious substance formed in croup, and the surface underneath looks of a bright red colour, is nearly level with the adjoining parts of the membrane, and seems more like the blush of erythema than the relic of mortification. It must however be understood, that it is only in the most favourable cases that such a termination is to be expected; for where the constitution is weak, and the attack of the disease severe, we find the casting off of one slough to be succeeded by the formation of another, until a deep and very foul ulcer is produced. I believe that, wherever croup has appeared to have been contagious, it will be found that the malignant scarlatina has prevailed also; and that the occurrence of the laryngeal or tracheal disease was occasioned by the spreading of the inflammation from the fauces to the windpipe, or perhaps by the actual presence of one of these sloughing ulcers in the immediate neighbourhood of the glottis.

In connexion with this subject, spasm constitutes too prominent a symptom to be passed over in silence; for although it is so far not necessarily connected with the inflammatory action that it may be and often is present without it, yet, on the other hand, it so certainly manifests itself on every occasion where inflammation appears, adding considerably to the patient's suffer-

ings, and very frequently causing his dissolution, that it may well be considered as forming an important symptom in affections of this nature\*. Spasm, however, is not a disease either of mucous membrane or of the submucous tissue; for neither of these structures appear to possess within themselves a power of contractility adequate to explain the phenomena of this irregular action, but of the muscles situated around or in the neighbourhood of mucous canals, the natural and healthy uses of which are connected with the functions of them. In proof of which it may be observed that spasm does not occur in the membranous mucous ducts, or in that part of the urethra anterior to the bulb; whilst it is most frequent in those situations where the canals are subjected to the influence of strong, frequent, and irregular actions of adjoining muscles, as in the bulbous portion of the urethra and in the larynx. Whatever can excite these muscles to action will occasionally be the cause of spasm. Sometimes it appears spontaneously, or at least its occurrence will not admit of pathological explanation, unless by saying that it is symptomatic of some other disease, or the result of sympathy with some distant irritation. Thus, spasm of the glottis is by no means an infrequent symptom of hysteria; and it also occurs in children under the irritation of teething or of deranged digestion. Spasmodic affections of mucous canals without lesion of structure, are far less frequent in adult subjects than in the young: that in the

\* In opposition to the idea of spasm only occurring in situations that admit of being acted on by muscular contraction, there is a case related in the 11th vol. of the *Edinb. Med. and Surg. Journal*, the dissection of which shewed a contraction of the trachea to more than two-thirds of its diameter, and one inch and a half in length, situated midway between the larynx and the bifurcation of the trachea. The contraction relaxed gradually after the tube was slit, so that, the day following, the part did not appear contracted, or in a state of disease of any kind.



glottis has not, as far as I know, been observed in the adult male. Sometimes spasm is obviously the effect of some direct stimulus applied either to the mucous membrane or the muscles themselves; thus the accidental admission of any irritating substance, such as a particle of salt, into the larynx, may occasion a fatal spasm, and always produces a dreadfully harassing cough, which often continues long after the cause of offence has been expelled. Spasmodic paroxysms of dyspnœa always appear with more or less severity in cases of inflammation or other diseased action being present in the mucous membrane of the larynx or its immediate vicinity. However, whatever may be the exciting cause of spasm, its effects, with reference to the respiratory organs, are really dreadful. In the child, particularly in the infant, they are sometimes suddenly and unexpectedly fatal. Even in the adult state, I am aware of cases in which death could be accounted for in no other manner. In advanced life, however, they are rarely directly fatal, but they are always harassing; and hence it is that, in asthma and other chronic forms of dyspnœa, so much relief is obtained by the smoking of stramonium, tobacco, or the use of other such powerful antispasmodics.

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Having thus laid before my readers a slight and superficial view of the principal pathological facts connected with the inflammation of mucous membranes, and of the symptoms found to accompany them, they will be better prepared for entering upon an examination of those diseases which appear within a limited portion of their extent, namely, the larynx and trachea; for however the respiratory tube may be affected, or in whatever structure the disease may have been originally situated, still the affection of the membrane that lines it will exercise such a decidedly modifying influence on its symptoms, that they can neither

be understood nor explained without some previous acquaintance with the pathology of mucous tissues. It must be apparent now, that besides the numerous accidents to which the respiratory tube is exposed by its situation and peculiar functions, it must also be liable to many idiopathic diseases, all of which will present shades of difference according to the structure originally attacked, whilst they will resemble each other in all symptoms occasioned by simple interruption or derangement of respiration. Into a consideration of all these diseases, or even the greater part of them, it is not my purpose to enter: they belong more exclusively to the province of the physician. But those cases which demand surgical interference, which can be thus relieved, and perhaps thus only, are sufficiently numerous to attract the attention of the surgeon, and sufficiently important to arouse his interest; and therefore I shall confine myself to those accidents and diseases for the relief of which the operation of bronchotomy has been either practised or proposed.

The idiopathic affections of the larynx and trachea falling within this description are, acute inflammation of the mucous membrane occurring in the child, constituting croup or cynanche trachealis;—spasmodic croup without the existence of inflammation;—inflammation of the submucous tissue of the larynx in the adult, or acute cynanche laryngea;—thickening of the mucous membrane, or chronic cynanche laryngea;—ulcerations of the mucous membrane, whether of a specific nature or otherwise;—diffuse inflammation of the cellular tissue around the larynx or trachea;—alteration of structure in the laryngeal cartilages, or phthisis laryngea;—sloughing and death of the cartilages;—and the pressure exercised by abscess, aneurism, or other tumour in the neighbourhood of the windpipe, obstructing the passage of the air.



The affections of the larynx arising from accident are, the irritation and inflammation occasioned by the swallowing of boiling water, or the stronger acids; the admission of foreign bodies within the windpipe; and the injuries inflicted by wounds, principally in attempts to commit suicide. Bronchotomy must also be considered as part of the means it might be necessary to resort to for the recovery of suspended animation.

### CYNANCHE TRACHEALIS, OR CROUP.

Definition — Varieties — Pathology — Inflammatory Croup — exciting Causes—Symptoms—Treatment—Question of Bronchotomy considered — Chronic Croup—Symptoms—Treatment—Bronchotomy—Spasm of the glottis—Symptoms—supposed exciting Causes—Treatment—Bronchotomy as a means of Resuscitation — Diphtheritis—Symptoms—Treatment—Cases of Croup.

Every affection of the windpipe occurring in the child, producing difficult respiration, with a peculiar ringing sound, and accompanied by a short, frequent, and dry cough, has been included under the one generic name of Croup; and perhaps justly so, as the phenomena are so truly characteristic of the disease, that they leave very little doubt on the mind of the practitioner as to the general nature of the case. But it is evident, notwithstanding, that these affections will admit of considerable variety, both as to the supposed originally exciting cause of the disease, its intensity, and the rapidity or slowness of the process of inflammation,—the prevalence of any one particular symptom,—the supposed seat of the disease,—and the nature of the morbid action going forward in the part. Accordingly the divisional arrangements of croup have been extremely arbitrary, and we hear of idiopathic and symptomatic croup,—of acute and chronic, — spasmodic, — laryngeal, — tracheal, — membranous and diphtheritic croup, as frequently and as familiarly as if any very

decided practical utility could be derived from a knowledge of such supposed varieties. But, perhaps, all divisions of disease not founded on pathological distinctions, or not involving some material point of practice, are at best useless; and may be injurious to the student in producing that worst species of ignorance—the mistaking a knowledge of the names of things for that of their nature. Laying aside, therefore, all distinctions of an arbitrary nature, we shall proceed to consider Croup under the forms most commonly developed by dissection, the only grounds on which the existence of variety in disease can be satisfactorily established.

The name of “Croup” has been applied to many diseases of different and even opposite pathological conditions. The first, that to which the name most properly belongs, is a purely inflammatory affection, and exhibits all the appearances and all the stages of acute inflammation of the bronchial membrane in the child. This is the form of disease which produces the adventitious layer of coagulating lymph, is by far the most frequent of occurrence, and, when acute in its symptoms, very generally has both a rapid and a fatal termination. The second is altogether a chronic disease, and must be very rare; for out of an immense number of subjects I have only met with two examples. It is where the lining membrane of the larynx has become altered and thickened in structure, so as altogether to spoil the natural appearance of the organ, and of course to interfere with its functions. The commencement of this disease is extremely insidious, its progress slow, but its termination inevitably destructive. It is comparatively common in the adult, where it constitutes one of the examples of chronic cynanche laryngea. The third, in which dissection after death can discover no morbid change of structure, nor the results of any increase of action. The larynx and trachea appear pale and smooth and polished,



without any indication of vascularity or thickening of the mucous membrane; and the occurrence of death can only be explained by supposing the existence of some irregular action, such as spasm. This form of croup is by means infrequent, is often fatal, its attack is sudden, and it carries off its victim with a rapidity that almost precludes the possibility of surgical interference. The fourth is the diphtherite, a form of disease which Bretonneau considered identical with inflammatory croup. It commences usually in the tonsils and fauces, and is sporadic, extending downwards into the larynx and trachea: it is often epidemic, and always attended by fever of a low and typhoid character. The nature of this affection is so entirely opposite to that of true inflammatory croup, and its treatment obviously so different, that I should scarcely have alluded to it, had not Bretonneau recorded one case in which tracheotomy was successfully performed in this disease.

The exciting causes of inflammatory croup seem, in some instances, to be involved in obscurity, the disease making its appearance suddenly, and without any previous warning. In some particular situations it is evidently more prevalent than in others, being rarely met with in high, dry, or mountainous districts; whilst in low, moist, and foggy places its visitations are both frequent and severe. It is, however, by no means necessary that such a condition of the atmosphere should exist in order to the production of croup, for it is occasionally met with during the warmest and finest seasons. There seems also something like a predisposition to the disease in particular families, many individuals of which shall be successively attacked by it; whilst other children, placed under exactly the same circumstances with respect to local influences, diet, clothing, and general management, shall escape completely free. Individuals also appear occasion-

ally to possess a similar disposition, for we see one child in a family to suffer five or six times from croupy affections, and not one of the others ever exhibit a single symptom. There are still others in whom this disposition exists so strongly, that any slight exposure to cold produces croupy breathing and cough; but in general these attacks are not very dangerous, as each successive affection seems milder and more manageable than the preceding.

As croup is generally an affection purely of an inflammatory nature, any cause capable of exciting this diseased action will be sufficient to produce it. Thus, indifferent clothing, unwholesome food, and want of general care, may be considered as its remote or predisposing causes; whilst its immediate will be found in occasional exposure, injudicious change of dress, mechanical injury or irritation, or any other of those circumstances found to produce inflammation in other structures. It is very questionable whether the usual privations attendant on a state of poverty exercise any very decided influence on the production of croup. Allowing for the difference of numbers in the different ranks of society, it would appear to be much more prevalent among the rich than the poor; a circumstance that can be accounted for, partly by the degree of hardihood acquired by those little beings who run about nearly naked all the year round, and partly from the nature of their food being less likely to produce visceral derangement. Nothing seems to me more certain than that the habit of pampering children with improper food, or feeding them too highly as to quantity, very frequently predisposes to croup; and hence, perhaps, the foundation of the remark, that it most commonly seizes on the fattest and finest children.

Considering croup as a purely inflammatory disease, it would be only reasonable to expect that its attacks should be preceded



and ushered in by those premonitory symptoms generally attendant on internal inflammations. But in this respect it presents very great varieties. Sometimes the child may have been observed during two or three days to have been languid, restless, and uneasy; its skin hot and dry; its tongue foul, and that it refuses its usual food. Young children are apt to become peevish and fretful, and refuse to leave the nurse's arms for a moment. If the patient be more advanced in age, the symptoms are often more clearly developed, and the shivering, headach, nausea, and other characteristics of fever, are easily to be observed. However, if these symptoms are not very severe, the child will be disposed to struggle against them, particularly if it is afraid of being obliged to take medicine, or being restrained in its usual gratifications, so that frequently its mother or nurse will not have perceived its illness until croup appears all at once in a shape so formidable as not to be mistaken. Occasionally, however, the disease makes its attack without any previous warning whatever, and the attendants are alarmed at night by the cough and croupy breathing of a child that had retired to rest in perfect health. The early symptoms are, an excessive restlessness, with difficulty of respiration, accompanied by dry, short, and incessant cough. The character of this cough is very peculiar: it occurs every minute, or perhaps oftener, but it is a single, solitary cough, without any thing like a paroxysm and without expectoration. The patient may easily be observed to be suffering from some irritation in the throat, which would be relieved if he could but expectorate. The sound of the breathing is very characteristic: it is shrill, harsh, and sonorous, and has been described as resembling the passage of air through a brazen tube. The restlessness increases, and even in the countenances of very young children something like an expression of anxiety and agitation may be traced. When the

patient is more advanced, this expression is very evident, and he will in general submit to any proposal for his relief. A sweat soon breaks out over the upper part of the body, which hangs cold and clammy on the forehead; the eyes appear prominent, and the cheeks slightly swollen.

If not relieved in the earliest stages, the characters of the disease and the appearance of the patient soon alter: the inspirations are more slow, long and laboured, drawn with almost convulsive energy, and with every muscle that can assist brought into action: the expirations are comparatively easier. Like every other form of laryngeal disease, spasmodic exacerbations frequently occur in croup: the patient must then either be raised up, or he flings himself on his face, and works and struggles as if convulsed; and if the spasm of the glottis be severe or long continued, the blood may cease to be arterialized in sufficient quantity to maintain the functions of the brain, and the patient dies in a convulsion resembling that which might be occasioned by malformation of the heart, or other derangement interfering with the due arterialization of the blood. The sound of the breathing becomes stridulous or whistling, conveying the idea of air forcing its passage through a contracted aperture. The cough is still harsh and incessant, but sometimes the patient, in his efforts to expectorate, brings up some few flakes of separated lymph, mixed or rather streaked with blood or with a tenacious bloody mucus. The voice is entirely impaired, the little patient being scarcely able to articulate so as to be understood. The countenance now is pale, puffed and swollen, with a cold damp upon the forehead: the lips purple, and yet pallid—the eyes glassy, white, and apparently protruded—the nostrils dilated—the veins of the neck more distended than usual—the larynx moves upwards and downwards in the neck from the violent



efforts to breathe—the chest seems to heave convulsively, and every symptom indicates the extreme anxiety of the patient to inflate his lungs.

Towards the latter end of the disease, the efforts of the child to carry on respiration become gradually more feeble and languid: its countenance is pale—its eye sunken—and its lip pale and bloodless. It ceases now to toss itself about; and although respiration is carried on with considerable apparent muscular exertion, and with the same shrill sound, yet the vital energies seem to be considerably impaired. Convulsions, if they have not previously appeared, are seldom wanting in this stage, and may continue with intervals to the last moment of existence. During the last few hours the patient is usually comatose—it lies stupid and insensible—incapable of being roused—breathing with extreme difficulty, and only by respiration giving any sign of life.

It is not always that croup exhibits those characters already described, neither is it by any means necessarily fatal. It sometimes happens that the inflammation may be cut short, and the progress of the disease arrested before it has produced the effusion of coagulating lymph; and even after this occurrence has taken place, it is possible that the membrane may be separated and expelled by coughing, and thus a recovery be effected. The symptoms, too, may be of an exceedingly chronic nature, and the intensity of the inflammation never proceed to the extent of causing the effusion of lymph. In such cases the difficulty of respiration is rather to be discovered by observing the motions of the patient's larynx and chest, than by the sound of the breathing, which is often so indistinct as not to be clearly perceptible to the ear. The cough, also, is neither so frequent nor so harsh; but neverthe-

less the termination of those chronic cases is by no means so favourable as the comparative mildness of the symptoms would seem to indicate; for the constant excitement to which the larynx is subjected, and the increased and irregular actions it must occasionally undergo in order to maintain respiration, will produce a tendency in the mucous membrane to become altered and thickened in structure, and thus lead to a certainly fatal issue with more protracted suffering.

If there is one point of medical practice which more than another has engaged the attention of the profession, and given occasion to many valuable observations on the subject, it is croup. Nor is the interest it excites at all surprising. The natural horror felt at the idea of suffocation, and the pain experienced in witnessing its effects;—the generally interesting age of the sufferer, and the compassion which this circumstance alone naturally begets;—the uncertainty which prevails as to the management of the case;—the inability of the practitioner to arrest the progress of the disease when once it has been fairly formed;—its sudden access;—the rapidity of its march and its too frequently fatal termination; all these have conspired to render croup an object of peculiar attention, and to induce practitioners to give to the world the result of their observations. But hitherto I have not been able to discover any attempt to arrange the treatment of croup with pathological precision, and accordingly numerous and often opposite medicines have been recommended, as each has been employed by different persons, and found to be more or less successful. Bleeding, both general and local; the application of blisters; the use of the warm bath; the exhibition of purgative medicines, of emetics, of antimonial preparations, of calomel; and, in short, the adoption of almost every means which has held out a hope of resolving inflam-



mation or arresting the progress of diseased action, has been followed by apparent success, and of course been warmly recommended. The operation of bronchotomy has also had its advocates, and cases are on record in which a recovery has been mainly attributed to its adoption; but there is no form of the disease, or no period of its duration attempted to be pointed out in which one remedy is more clearly indicated than another; and amongst an immense number of different modes of treatment, the young practitioner is left either to select by chance, or to attach himself to that which is recommended by the authority he most respects.

Acute cases of croup should be considered as examples of inflammation occurring in a particular structure, and tending to a certain given termination. The nature and uses of the organ of which this structure forms a part; the necessity of its functions being constantly performed, and the consequent impossibility of the organ obtaining repose; the importance of these functions to life, and the nature of the parts which may be affected either directly or by sympathy in consequence of the organic derangement, must all be taken into consideration in attempting to lay down a rational mode of treatment for this formidable disease. In the commencement the disease is incipient inflammation; and the indication is, to subdue this morbid action, and prevent the production of an artificial membrane within the larynx or trachea. The second stage is after the lymph has been secreted, and then (if we possessed the means) the object should be to procure an artificial passage for the air, which would afford the double advantage of preserving the lungs from congestion, and allowing repose to the larynx, whilst, by the common process of nature, the adventitious membrane might be separated and expelled. And the last stage of croup

presents itself when the functions of the brain have become impaired in consequence of being supplied with an improper quality of blood, and of course all the energies of the animal machine are weakened in proportion. The result at this period must be fatal, for even if free respiration could be restored, the brain will not be able to recover so as again to perform its healthy functions. Of course, in conjunction with these measures, every care must be taken to remove irritation from the bowels, and to combat every accident which might even indirectly interfere with the recovery of the patient.

It will in general be found that cases of recovery in croup have been frequent in proportion to the early adoption of remedial measures; because it is one thing to check inflammation and prevent its effects from taking place, and another to remove those effects when they have been fairly formed; and because it is to the first of these objects that the treatment of croup has been directed. But it appears to me not to be sufficient to diminish an increased action, unless the constitution be kept, until the period of danger is over, in a condition that will render a renewal of that action unlikely to occur; for, however a patient may be brought down (suppose by bloodletting), if he is not kept in this state a re-action will take place, and a disposition produced in the system exceedingly favourable to the progress of inflammation. It is this which causes even large bleedings to be so frequently inefficacious in the treatment of acute diseases, and renders a repetition of them necessary before the affection is subdued; whereas one operation of the kind, if followed by measures calculated to maintain a state of nausea or debility, will usually be sufficient.—In many inflammatory affections, such as those of the head or of the gastric organs, the exhibition of medicines possessing these powers is plainly im-



possible ; but in those of the throat and chest similar objections do not obtain, and I have used them frequently with, at least, a fair proportion of success.

Bloodletting, in croup, should be always general, because the object is to produce direct and immediate debility, and the arm or the external jugular vein may be indifferently chosen for the purpose. Topical bleeding by leeches, &c., may be resorted to in cases where, in consequence of the child being very fat, it may be difficult to discover a vein, but otherwise I regard this practice as highly objectionable. It does not answer the purpose of immediately reducing the patient ; and it is questionable whether it can produce any effect on the vessels of a part which lies so far removed from the surface. The oozing of the blood renders the condition of the patient uncomfortable and filthy. The hæmorrhage is often so difficult to be controlled as to render bandages and compresses necessary ; and these, applied to the neck, never fail to aggravate the sufferings of a patient already perhaps in a state of suffocation. But what is more important, it is often absolutely impossible to stop the bleeding from leech-bites on children, and many have perished from this cause alone. Has not every practitioner seen children pale and exsanguineous, with heaps of rags and flour and lint piled over the punctures in order to stop the blood, which still continued to trickle, notwithstanding the weakness of the little patient, until the powers of life become irrecoverably impaired ? Therefore, in all cases where it may be practicable, I would prefer general bloodletting ; and this should be followed by the exhibition of some preparation of antimony calculated to produce a state of nausea, and no more. I know that the difficulty of putting this plan of treatment in execution will be objected to it ; that with very young children it may be impossible, and not easily accomplished with

those of more advanced age. But in many cases the difficulty is more imaginary than real; and with caution, carefulness, and watching, scarcely any will occur that may not thus be most advantageously treated. An intelligent assistant should remain in the house with the little patient; he should superintend the administration of the medicine himself, and, having once succeeded in producing a state of debility, it is very easy to maintain it afterwards.

The efficacy of tartar emetic in inflammatory affections, particularly of the lungs, has been so extensively known and acknowledged, that by some it has been supposed to exert a specific influence on this class of diseases; and larger doses of the medicine were administered than had been hitherto regarded as judicious or even safe. This, however, is not the object I have in view; neither is it the mode in which I have most successfully employed it. I wish, having produced a decided effect on the system, to maintain it in such a condition as will prevent the inflammation from developing its usual and natural effects; and this is accomplished most easily by the administration of very small doses of the medicine at intervals that are to be regulated by its effects. I generally order a grain or two grains, according to the age of the patient, to be dissolved in eight ounces of water, with a drachm or two of the compound spirit of lavender, and administer one table-spoonful of the mixture; regulating the subsequent doses by the effects of the first, and endeavouring by every possible means to prevent the occurrence of vomiting. Since I have adopted this mode of treatment, I have seldom lost a patient whom I had an opportunity of seeing within a few hours after the commencement of the attack.

Emetics are a class of medicines that have obtained much

celebrity in the treatment of croup, and probably with some justice: it is well known that an emetic will often cut short the progress of local inflammation altogether: but if it does not effect this purpose at once, the re-action subsequently produced is almost certain to prove injurious. Hence the reputation of these medicines is by no means universally established; some practitioners depending on them almost exclusively, and others rejecting them as uncertain, or perhaps useless. In the secondary forms of croup, it has been supposed that the shock of an emetic will be favourable to the expectoration of the adventitious membrane; but supposing that it was so, its employment might still be hazardous, for, if the lymph is loose and unattached, it might be forced against the rima glottidis, and the patient suddenly perish by suffocation. Notwithstanding these objections, however, there can be no doubt that emetics may prove a valuable adjunct to more active treatment, although, in my judgment, they are by no means entitled to that entire confidence reposed in them by some practitioners. When the child is fat and plethoric, has been unaccustomed to exercise, and fed highly; when he has been suddenly attacked, and perhaps after eating a hearty meal, it will be most desirable to evacuate the stomach; but there is this disadvantage attending the practice, that it will be next to impossible to administer nauseating medicines afterwards.

Croup is always attended by spasmodic exacerbations; and these, if not originally excited by intestinal irritation, are always considerably aggravated by it. For this reason alone, purgative medicines would be most clearly indicated, and their administration should never be overlooked; but they are too slow in their operation to be solely depended on in a disease which runs its course so rapidly as often to destroy life within forty-eight



hours. The same objection will hold good with respect to blisters; they are too dilatory in producing their effects, and, besides, they cannot be resorted to at an early period without considerable risk of doing mischief. It is always hazardous to apply a blister in the immediate neighbourhood of inflammation, and particularly so if the constitution has not previously been brought down by bleeding and other evacnants, lest it should increase the evil it is intended to remedy. But a consideration of more importance is, that patients who have laboured under difficult respiration for any time always have their vital energies impaired. In some instances, a blister has seemed to be perfectly inert—has never risen, or even produced a rubefacient effect: in others the consequences have been truly formidable, deep and extensive sloughs having formed wherever the blister had been applied. In the more advanced stages of croup, when the lungs are congested and there is a tendency to effusion within them, there seems to be less objection to the use of this remedy as applicable to the chest itself. But, after all, where is the value of removing this congestion, if it was even in our power to do so, without at the same time relieving the obstruction to the respiration which occasioned it? I have generally found the application of a blister to the chest in this disease to be nearly useless; when applied to the throat, it has but too frequently proved worse.

The exhibition of mercury has also had its advocates in the treatment of croup, and within my own experience it has appeared occasionally to have produced material benefit; but its use is nearly confined to long-protracted and chronic cases, where there is a tendency in the mucous membrane to become thickened and changed in its structure. Sometimes, in large doses, it has seemed to have been useful even in the commencement of acute attacks, although either here or in more chronic affections it is

not easy to explain its mode of operation. It is very rarely that calomel, however administered, produces any sensible effect on children under nine or ten years of age, except when it exhibits its purgative effects; but something else must be looked for with reference to its operation in the cure of croup, for certainly it accomplishes more than could be expected from any other purgative whatever.

Hitherto I have spoken of the management of croup, with reference to medical treatment alone, without supposing a necessity for surgical interference; but as there certainly have been cases\* in which bronchotomy at least seemed to be of service, it becomes necessary to inquire into the following questions:—When or at what period of the disease ought the operation to be resorted to, or is it indifferent in this respect whether the wind-pipe be opened in the beginning, the middle, or towards the latter end of the malady? How is it that the operation may be supposed to procure relief? What are the symptoms that indicate its necessity? What has been its usual success, and what are the objections that may be urged against its adoption under any circumstances? These are material points to be determined, unless it be imagined that every recovery after operation is purely accidental, and would have in all probability occurred had the knife never been employed at all.

Those who would argue in favour of the operation might advance, that it has succeeded more than once when resorted to nearly at the termination of the disease, and when every other hope had fled;—that it produces immediate relief, and that, even when not ultimately successful, the tranquillity it affords the

\* See *Medico-Chir. Transactions*, vol. vi, p. 151, a case of successful operation by Mr. Chevalier.

patient more than compensates for any pain he may have suffered;—that the diseased action is in the great majority of cases circumscribed to the larynx alone;—that even, if inflammation be present in the bronchial membrane, there is no reason to suppose it would be aggravated by the operation;—that thus a free exit would be provided for the effused lymph, or for any accumulation of mucus that might occur; and that without some effort of the kind the disease must have a fatal termination. These observations are certainly more or less founded on fact, but they go a very short way in establishing the advantage, much less the necessity, of resorting to a severe and difficult operation.

The effusion of coagulated lymph is very generally confined to the larynx alone; but still in a number of cases the inflammation commences in the bronchial cells, and proceeds upwards in the windpipe. This is an affection in which an operation could not possibly be of service, and there is no mode of distinguishing accurately as to what has been the original seat of the disease\*. This one consideration must involve every case in

\* In a paper published by Mr. Goodlad, of Bury, the object of which is rather to establish a successful mode of practice than to detail the diagnostic symptoms of croup, I find it advanced that “In this complaint every gradation may be traced (by placing the ear within a short distance of the patient’s chest) from the brazen-like sonorous cough to the gentle stridule, heard more faintly as the patient approaches to convalescence.” There can be no doubt that the laryngeal sounds are indicative of the violence and consequently of the danger of the disease; but the application of the stethoscope or of the ear, even directly to the walls of the chest, affords but little information as to the state of the parts within, unless to a person of singular experience in auscultation. The noise of croupy respiration masks and confounds every sound within the chest to an extent that renders it next to impossible to approach an accurate diagnosis. It has been remarked that in such cases the inferior and pos-



obscurity, and render the success of an operation a matter more dependent on chance than on judgment. Again, if it be true that inflammation interferes with the functions of the bronchial membrane, and that the blood will be imperfectly arterialized when such disease is present, it will be of little consequence whether air be admitted or not; the brain will as surely be affected as if no artificial opening had ever been practised, and all the relief the patient will experience can amount to no more than a cessation of that extreme muscular exertion which is necessary to carry on respiration at all. I saw this admirably exemplified in the case of a little girl on whom bronchotomy was performed for the cure of croup: the disease had originally been confined to the larynx, but after the operation the bronchial cells became affected, and the inflammation spread upwards nearly to the place in which the trachea had been opened. In this instance there was no deficiency of air: the aperture was much larger than the natural size of the rima glottidis, yet the patient had convulsions, exhibited every symptom of cerebral congestion, and finally died comatose.

In a disease that runs its course with such rapidity, it would be desirable to ascertain at what period the operation should be performed. The anterior part of the lung is the most favourable place for examination, an observation that I have seen verified in some laryngeal affections in the adult; but in the child, where the respiration is loud and ringing, the sound is heard over every part of the chest, and must render every other imperfect and indistinct. I am aware, however, that some persons claim for themselves a surprising accuracy in auscultation, and, as I do not possess any great proficiency on my own part, I shall not presume to question it: but judging from my own experience, and more particularly from what I have witnessed in others, I still feel justified in asserting that there is no mode of distinguishing *accurately* as to what has been the original seat of the disease.

performed, and what are the symptoms that indicate its necessity. In the earlier stages, when the membrane is red and swollen, and no lymph as yet effused, there can be no object in making an incision which will be much more likely to aggravate the disease than to relieve it. When the adventitious membrane has been formed, there is some reason to think that in the great majority of cases sufficient mischief has been already accomplished to render a recovery very problematic. The lungs have been already loaded with blood: perhaps effusion has been begun, and it may be, from the irritation it has undergone, that the mucous membrane of the bronchial cells has already taken on a disposition to inflammation. It may be that the brain has already become affected, for I have met with many instances in which the disease proceeded with such rapidity that no lymph has been effused, and yet the patients never during life shewed any symptom that could mark a difference between the two cases. At the latter stages of croup, it would be absurd to think that an operation could possibly prove beneficial, unless it be supposed that a wound of the windpipe could remove cerebral congestion; and therefore whenever convulsions have occurred, or that the patient appears comatose or sinking, let no man undertake it as a last resource; for it is a resource that will avail him little, and after his patient's death he may esteem himself fortunate if a great part of the blame is not laid to the account of himself and his knife.

It will be necessary to draw a distinction between the struggles a patient may make to free himself from some obstruction in the windpipe and the convulsions just alluded to, for in both cases the patient's countenance will become dark and purple, his eye suffused and staring, and his respiration heaving and laboured; and both these affections occur at a late period of the disease. If the inflammation is about to subside and to termi-

nate in an extensive effusion of mucus, the patient's struggles to relieve himself from the oppression naturally created by the accumulation of fluid in the respiratory tube, must be not only distressing but injurious, and may prove fatal. In this case an operation which will afford a clear and easy passage for the fluid will probably be followed by the happiest consequences: or, if there was reason to believe that on the total subsidence of the inflammation, the membranous lymph existed in the trachea purely in the condition of a foreign body, an opening which would afford means for its easy expulsion might also be judicious. But it is unfortunate that no symptoms exist by which a practitioner can positively establish the propriety of his operation; there are in both these forms of disease the same cough—the same difficult respiration—the same struggles to inflate the lungs and to free the air-passages from the impediments that are within them. To these sources of difficulty <sup>\*</sup>may be added, that any obstruction to the air cannot endure long without the lungs becoming loaded and oppressed, and therefore, if the operation is not performed almost at the exact minute between the subsidence of the inflammation and the commencement of the effusion, it will scarcely be successful. Thus it happens, that in the great majority of cases, when bronchotomy has been performed, the patient finds himself wonderfully relieved; great quantities of mucus are expelled by the wound; respiration is free, and a surprising degree of tranquillity seems to be suddenly obtained. But the calm is only deceitful. In the course of two or three days the patient begins to sink. He is unable to expectorate the mucus which now accumulates in greater abundance than before. He becomes heavy and languid—is with difficulty roused from this state of stupor—and generally within four or five days after the operation he dies comatose.



It sometimes, although perhaps rarely, happens that the mucous membrane of the larynx in children becomes thickened, the ventricles filled up, and the general configuration of the organ so changed and spoiled, that the part after death presents the same appearances as in the chronic laryngitis of adults. This form of disease is not inflammatory, at least it is not necessarily so, and therefore it is seldom preceded by constitutional fever. It seems to steal upon the patient, thickening the laryngeal membrane and destroying its organization, occasioning at first only a slight wheezing and a cough, which gradually increase until the disease bursts upon the attention of his friends in all its formidable and fatal colours. The symptoms are those of obstructed respiration, and evidently mark the difficulty with which the air forces its passage through the rima glottidis. The motions of the chest are much more frequent and more convulsive than where the membrane is only inflamed, and the cough, though harsh and teasing, is to the last moment unaccompanied by expectoration. Medicine and medical treatment are here most frequently expended in vain. Bleeding will not arrest the morbid action, and is injurious because it directly impairs the powers of life: the application of blisters is uniformly inefficacious. Emetics and purgatives afford a short and transitory relief; but the disease still urges on its destructive career until the lungs, becoming loaded with blood, throw out a copious serous effusion, and, after a convulsion or two, death closes the scene.

It must be understood, however, that in the foregoing description the disease is spoken of as fully formed, and having assumed a character of incurable disorganization, the progress of which cannot be interrupted. In its more early, and of course its more manageable, stages it seems reasonable to suppose that

its ravages may be prevented by the operation of medicine, and this is probably the affection in which calomel has been found so often efficacious. Every practitioner must have experienced the efficacy of this medicine in the earlier stages of chronic croup, and its success may be explained on the grounds of its alterative effects having arrested those morbid actions, and prevented those changes of structure which, if once formed, can never be removed.

If it be assumed as a general principle, that diseased alterations of structure will not admit of cure unless by the extirpation of the part, it necessarily follows that any operation falling short of accomplishing this object can, under the most favourable point of view, be only considered as palliative. With respect to an ultimate cure it must be unprofitable, and the attempt may have the effect of bringing such operation into disrepute. For this reason bronchotomy seems totally unsuited to the advanced stages of this form of croup. It may relieve the patient's immediate distress by opening a free channel for respiration, and thus give birth to a fallacious hope—it may prolong a wretched, and, to a child, a useless existence for a few short days—but it cannot effect a cure, and therefore there can be no reasonable motive for undertaking it. But, in the earlier stages, and before any incurable mischief has occurred, I can readily conceive that an operation which will procure for the diseased organ perfect and entire repose, may prove highly beneficial. In all morbid actions whatever, the advantage of absolute rest is so clearly ascertained, that it forms a part of every surgeon's directions in their treatment; and perhaps the constant tendency of laryngeal diseases to become progressively worse may be explained, by the impossibility of the functions and motions of the part ever being suspended even for a moment. Nay,

as the disease advances, we see these motions increased even to a degree of convulsive exertion, which children cannot bear up against so long or so well as adult patients; and when the condition of a person thus struggling to maintain respiration is contrasted with the calm he enjoys after an artificial passage for the air has been effected, it cannot be denied that, if there is a chance of arresting the progress of the disease, it must be by placing the organ in the most perfect state of rest. Then the operation of calomel or of any other alterative may come fairly into play, and, if the diseased action has not proceeded to an incurable length, there will be every rational prospect of a permanent recovery.

It will be found, however, in practice, that the friends of a little patient will scarcely listen to the proposal of what appears to them a cruel and dangerous operation for the relief of merely a slight wheezing or a trifling cough; and the surgeon cannot press his opinion with convincing arguments, for there really do not exist symptoms to point out this form of disease with any degree of exactitude, or to distinguish it from common chronic inflammation of the mucous membrane. The practice of operating under such doubtful circumstances must be purely empirical, and the result uncertain. It may, possibly, in a lucky case turn out favourably, and be at least the apparent cause of saving the patient's life. It may do neither harm nor good, and the disease pass on to its usual termination uninfluenced by it; or, what is much more probable, it may have the effect of converting a slow and chronic inflammation into one more acute and rapid, and thus have the effect of directly inducing that fatal termination it was intended to prevent.

There is another circumstance that should never be lost sight



of in discussing the propriety of performing this operation, and which has hitherto been scarcely noticed by authors. Of the absolute danger attendant on bronchotomy, considered *per se*, a vast contrariety of opinion has always existed, which shall be noticed more at large hereafter; but one fact seems to have been overlooked by all, namely, that in every case, no matter on what occasion or for what cause it has been performed, bronchitis is certain to follow. This, which is probably occasioned by the introduction into the lung of air that has not been warmed by passing through the nostrils and pharynx, may, of course, be of various degrees of intensity, and fortunately is in general but slight; yet I have seen it so severe as to occasion the death of the patient. This circumstance is really of some importance, for all subjects are not equally capable of enduring and resisting a bronchitic affection: the very young and the very old almost always sink under it; and patients who have long suffered from disordered respiration are equally unfavourable subjects. I by no means assert that a dread of such a consequence should for a moment influence the decision of an operator in a case otherwise unobjectionable; but where there is doubt and uncertainty, every consideration should be allowed its just weight, in order to arrive at a correct conclusion. In every instance the surgeon must be prepared to encounter this formidable affection; it generally makes its appearance within the first forty-eight hours, and is never delayed beyond the third day after the operation.

In the present state of surgical knowledge it would be presumption to attempt to lay down rules for the guidance of the practitioner in every possible case. Nature presents as much variety in the production of disease as in any other of her operations; and either in estimating the extent of derangement in

any individual specimen of disease, or in applying the most suitable remedy, a surgeon must, in a great measure, be left to the exercise of his own judgment. But in matters connected with operation there are a thousand circumstances calculated to lead a young practitioner astray, and to give a wrong direction to his opinion. There is a certain degree of reputation attached to the name of a dexterous and successful operator which he wishes to attain, and there is such an apparent difference between the rapid removal of disease by the knife and the more slow and silent operations of medicine, that perhaps naturally his inclination is turned towards the former. Every young man can bring forward in argument a few instances of successful operation to justify a similar proceeding on his part, whilst he forgets those which have not had such favourable results; and it requires two or three practical lessons of severe experience to bring down his too sanguine expectations. With respect to the particular disease under consideration, I think I have observed, that in proportion to the age and experience of a practitioner, so has been his unwillingness to propose or to practise an operation for its cure; and I know more than one who had been its warm advocates that since have expressed to me a very decided change of opinion indeed.

In this country I have not for some years heard of bronchotomy having been seriously proposed for the relief of any form of croup; and I feel considerable satisfaction in the reflection, that I have in some small degree contributed to the establishment of so desirable a practice. It is, however, to be regretted, that some uniformity of principle cannot be obtained, and that, even to this day, continental surgeons have left the treatment of the disease in this respect undetermined. Thus, at a comparatively recent period, we find one practitioner reading a paper on

“ the urgency of performing tracheotomy in croup,” and insisting that “ the operation should be performed without delay when the antiphlogistic remedies have failed ;” whilst another not only approves of the operation, but desires that the opening in the windpipe shall be made very large, in order to permit of the application of nitrate of silver to the inflamed surface within. It is impossible for me to be acquainted either with the opportunities or the experience of the gentlemen who have thus written ; but their doctrines are so wholly opposed to the practical results of observation here, that it is not easy to dismiss a suspicion of their being founded on speculation and theory alone. Moreover, after diligent search, I have not been able to find more than a few cases of successful operation in croup, and these attended with such curious and unusual circumstances, both of symptom and treatment, that it is doubtful how far they ought to be considered as examples of croup at all. Certainly I regard such reports, when I do not doubt their authenticity, rather as evidences of the possibility of escape than as examples which the teacher ought to adduce or the practitioner to imitate.

Quite independently of the difficulty of performing the operation of bronchotomy on a child, which forms, however, a most material objection, it is very doubtful whether it will ever become a favourite remedy in croup. Doctor Cheyne, in his work on the Pathology of the Larynx and Bronchiæ, states that there are always  $\frac{2}{3}$ ths of the canal free for the transmission of air, a space which would be sufficient to maintain the process of respiration even in an adult subject. It would appear, therefore, that the patient dies, not because there is an absolute insufficiency of air to provide for the arterialization of the blood, but because some change has taken place in the organ by which this most important function is performed. In all cases where



the disease consists of inflammation of the mucous membrane I feel satisfied that the artificial admission of any quantity of air (which is all that can be accomplished by the most successful operation) will confer no benefit on the patient beyond relieving him from the exertions he is obliged to make to dilate the rima glottidis,—exertions which he will make if the larynx be only partially closed, and a sufficient aperture for the passage of the air still remains. There is something exceedingly acute about the sensibility of the larynx; it soon feels the presence of even a slight impediment, and its actions and its efforts are redoubled to preserve respiration. Thus its muscles are thrown into violent and often irregular actions, there is spasm and cough, and the windpipe is moved rapidly and violently upwards and downwards in the neck; the patient then becomes anxious and agitated under the horror of suffocation, and all the muscles of inspiration are made to assist in expanding the chest and filling the lungs with air. Yet these symptoms may be produced whilst the larynx is only partially diminished in size; for I have seen a patient breathe calmly and tranquilly through a tube, the calibre of which did not approach near to the dimensions of the rima glottidis.

It would be wrong to assert positively that there are no cases of croup that might not be benefitted by the operation, because some instances have been put upon record in which it had been performed, and seemed to effect a cure; but what is the precise nature of the case to which it is applicable? what is the most favourable time for adopting it? and what are the symptoms which will regulate the surgeon's practice? Can any man exactly draw a line of distinction between the varieties of croup, and say that the inflammation in one case had commenced in the bronchial cells, and in another at the larynx—that in one instance

the adventitious membrane had been formed, and in another it had not? Can he distinguish between chronic bronchitis and morbid thickening of the laryngeal membrane? And if he cannot, is not his operation altogether empirical—just as likely to work out evil as good—undertaken without principle where it may do injury, and perhaps abandoned where it might have proved beneficial? To the casual success of such an operation I would attach no professional reputation, whilst I think much character may be lost to the individual, and general obloquy heaped on the profession by the too frequent performance of operations thus undertaken at a hazard, and almost always at a period of the disease when its efficacy (if it ever possessed any) must be exerted too late.

But Bronchotomy has in many cases of croup been successful. True—but where are the thousand and one instances to the contrary that might be brought against each single one of these? I have performed the operation myself on the child, and have seen it frequently done by others, and in no one case has the life of the patient been saved. I have known and heard of it often, but never understood that it produced a recovery; and I should suppose that my experience on the subject only resembles that of most men who have had opportunities of seeing and treating the disease. Most practitioners are fond of publishing cases of successful operations, but are not so willing to make known those of an opposite description, from an idea that these supposed failures might lower them in public estimation; but these detached and solitary expositions of fortunate surgery are calculated to produce very serious injury, if they encourage others to similar attempts in the hope of similar results. If it was possible to place a list of those cases in which Bronchotomy had not proved serviceable in array against those wherein

it had seemed to be useful, it would be scarcely necessary to advance any farther argument in proof of its uncertainty; and medical men would rather turn their attention to the improvement of that internal treatment which will generally be efficacious if resorted to in time, than look for advantage in the performance of an operation from which experience holds out such slender hopes.

The third form of disease to which the name "Croup" has been given, is one in which there is reason to doubt the existence of any organic lesion in the windpipe, and to attribute the symptoms to an irregular or spasmodic action of the muscles of the larynx. The existence of spasm of the glottis, and the possibility of its proving fatal, is now sufficiently known: it occurs as the accompaniment of disease in the larynx in all its forms, and in subjects of all ages; but without the presence of some morbid action, it is not met with except in the child, and occasionally in the hysteric female. As observed in the infant, it certainly does not deserve the name of croup, for it wants the leading features of the disease: there is not a continuance of sonorous and difficult breathing; neither is there that short, harassing, dry cough, which is so very characteristic. Hence it is, perhaps, that a variety of appellations have been given to the disease: it is the cerebral croup of Mr. Pretty; it has been admirably treated of by Dr. Marsh, of Dublin, under the name of spasm of the glottis; and forms the subject of a monograph by Dr. Ley, who has followed Dr. Mason Good in using the term *laryngismus stridulus*. Beside these authors, it has been alluded to and described by several; and is now so well known, and its treatment so generally understood, that little remains except to determine how far the operation under consideration can ever be made available.



In order, however, fairly to appreciate the remedial powers of surgery in this particular, a slight review of the nature of this affection may be necessary, and more especially of the formidable and often fatal manner in which it makes its attack. It occurs in very young children, and appears at the commencement of the period of dentition; sometimes earlier, and but rarely after the child has reached its third year; yet within the last few months I have witnessed an exceedingly well-marked example of it in a child nearly six years old, who was recovering from hooping-cough. The crowing noise that some infants make in respiration, and which nurses occasionally consider as a sign of thriving, is nothing more than the air rushing through the aperture of the glottis in a state of spasmodic constriction; and whenever this symptom appears, however well the infant may seem in other respects, it is always advisable to pay attention to it, and remove the source of any irritation that can be discovered. This disease exhibits itself under different forms, or rather different degrees, of intensity. In some instances the constrictions are momentary, the intervals between them long, and their effects apparently slight: yet even in these milder cases the patient is not safe. The infant may be, apparently, in good health, and in a moment he makes a violent effort to inspire, which occasions something like a faint scream or cry; becomes black and swollen in the countenance, and dies before assistance can be procured. In other cases there is a more obvious and decided paroxysm: the little patient throws himself back, gapes with his mouth widely open, his chest heaves laboriously, and his respiration is either suspended altogether for a few seconds, or carried on in gasps, with a peculiar stridulous sound. At length the paroxysm terminates in a long and deep inspiration, like that heard in hooping-cough; or, if it is to end fatally, the child works in such convulsive struggles as have led

many to believe that the sensorium was primarily and seriously engaged. There are other cases of still greater severity. I have recently seen a child in whom paroxysms threatening suffocation occurred on the slightest disturbance, and succeeded each other with wonderful rapidity: the smallest change of position—the slightest touch on the surface of his body—even feeling his pulse at the wrist, was sufficient to throw him into a fit, in one of which he died a few hours after I saw him.

The exciting cause of this formidable affection seems not to be well understood. In general it appears to be a diseased action consequent on irritation, and ought to be considered rather as a symptom than a disease itself: thus, in some instances it seems to be connected with painful or difficult dentition, for relief is instantly and almost magically afforded by a free division of the gums. Its apparent connexion with cerebral derangement has been frequently noticed; and it has been practically proved, that where the attacks are frequent and severe—where there is rigidity of the fingers or toes—or a more immediate approach to general convulsions, the application of leeches to the head has been productive of the happiest results. The presence of intestinal irritation, and the relief afforded by attention to the state of the alimentary canal, would warrant an opinion that derangement of these important organs might occasion this as well as other forms of infantile convulsion. In many cases, so simple a measure as the alteration of a child's diet, by changing its nurse, is eminently useful, particularly if accompanied by a removal to country air; and I believe it has been painfully experienced, in many families, that something like an hereditary disposition to this disease may exist—at least that many individuals of some families are afflicted by it in succession.

Other causes have been assigned for the production of this disease, some of which are eminently deserving of attention; at the same time it may be observed, that its being attributed to such a number of different influences, shews that its real exciting cause is probably still unknown, and must involve its treatment in considerable difficulty. For instance, either this disease, or an affection bearing a strong resemblance to it, has been described by Dr. Kopp, and more recently by Dr. Hirsch, of Königsberg, under the name of thymic asthma, and by them attributed to an hypertrophied condition of the thymus gland, which, by its weight and volume, presses on the heart, the lungs, the large arterial and venous vessels, and prevents the free exercise of their functions. Dr. Montgomery, of this city, has lately published an interesting paper on this subject, in which he attributes the sudden death to an enlargement of this gland, whether that arises from hypertrophy of its substance, or an alteration of its structure from scrofula or other disease; and explains how agitation or excitement may suddenly distend and increase the size of the organ, in such a manner as to affect materially the condition of the surrounding parts. Again, in a very recent work by Dr. Ley, who details the history and describes the history of the disease most admirably, a different explanation has been offered. Apparently relying on the experimental researches of Majendie and Le Gallois, he supposes that, if the recurrent nerves are compressed to such an extent as to have their functions impaired, the glottis, under the influence of the superior laryngeal branches, would become and continue fast closed. The cause of the disease, then, according to him, will be found in some tumour, scrofulous or otherwise, so situated as to create an injurious degree of compression on the recurrent nerves.



That an enlargement of the thymus gland may, from its situation, produce great and serious inconvenience, it would be absurd to question; and perhaps there is sufficient evidence to shew that it may occasion the symptoms and results of this very disease: but it is far from being proved that spasm of the glottis may not occur, and even prove fatal, in cases where no such enlargement existed. I am satisfied I have seen numerous instances in which there was no evidence of such enlargement, either from external appearance or otherwise. Alterations of size, shape, and structure, even if rapid, take place gradually, and their results should be gradual also; whereas I have known this disease to kill its victim in its first and only paroxysm: and moreover, if structural change in the gland was its sole exciting cause, it would be difficult to account for its sudden disappearance on the removal of the child to the country, and its diet being changed. Whilst, therefore, it may not be denied that hypertrophy of the thymus can occasion the phenomena by others attributed to spasm of the glottis, there is not sufficient proof of its being the general or even frequent cause of this peculiar disease.

But the hypothesis of those who regard it as arising from compression of the recurrent nerves rests on a still more uncertain foundation. It can be easily imagined, that in scrofulous children, in whom, as remarked by Dr. Marsh, this affection is most prevalent, glandular tumours may constantly be found near the course of these nerves; and if the results of the experiments of Majendie and Le Gallois were to be relied on, the existence of such tumours would form a specious explanation of its phenomena. But there is reason for not being perfectly satisfied with these results. In the first place, there can be no separation of

the functions of the superior and inferior laryngeal nerves, for the fibres of both are distributed to both orders of muscles—the dilators and constrictors of the rima; and, secondly, some experiments made here did not lead exactly to the conclusions arrived at by the physiologists already mentioned. I have lately, with the assistance of Mr. Alcock, divided the recurrent nerves of several dogs, and am satisfied that, however the operation may interfere with the voice of the animal, it has no *immediate* effect whatever on his respiration. In one dog, we divided the nerves very high up in the neck, immediately before their entrance into the larynx: its voice was instantly lost, but we could observe no change in the respiration; the animal was driven about, and hunted up and down stairs for a considerable time, but did not pant or give other sign of disordered breathing. In another, after the lapse of some time, the animal certainly could not endure exercise without experiencing some inconvenience; but it had been the subject of additional experiment, and it was after the division of the portio dura that the symptom became manifest.

It is evident, from the obscurity that involves the etiology of this disease, that no distinct and positive line of treatment can be laid down, and that it will be the practitioner's duty to watch every case with the most sedulous attention, in order to discover the particular source of irritation from which it proceeds. Fortunately, it is not a very fatal affection, and with due application to its general management it will seldom be necessary to resort to ulterior measures. Bronchotomy is wholly out of the question; for let the attack be ever so severe, and the danger ever so imminent, if the rima remains even so far unclosed as to allow of a partial transmission of air, we may be satisfied that the infant will struggle through the paroxysm: and where the case is otherwise, and respiration seems to be totally suspended, we cannot for a

few minutes be certain that it will not be restored by the efforts of Nature alone. Frequently has a child lain in a state of complete asphyxia for many seconds, when a long-drawn crowing inspiration, with a peculiar sibilous sound, announced the return of animation, and the case has ended satisfactorily.

But if the infant is to all appearance dead, and if the practitioner is called to him within any reasonable time, should he then endeavour to inflate the lungs and restore animation; and if he should, ought he for this purpose to perform laryngotomy,—or endeavour to pass a tube by the nostril into the trachea,—or be satisfied with the usual practice of introducing the nozzle of a bellows up the nostril, and, by pressing the larynx against the spine, endeavour to direct the current of air into the lung only? The answers to these questions must depend on the view taken of the pathology of the case, and on the habitude and dexterity of the operator in employing any given mode of resuscitation. If he regards it as proceeding from hypertrophy of the thymus, or other organic change, he will probably not attempt an operation so little likely to succeed; but if he considers it as a spasm of the glottis, he ought to proceed in this as in any similar affection. The trial is worth being made; for it can by possibility do no harm, and it seems quite as reasonable to expect a recovery by the immediate adoption of active measures in this as in any other case of suspended animation. What those measures are shall be discussed on a future occasion.

A short time previous to the publication of Bretonneau's work on diphtheritis, it was observed by Professor Mackenzie, of Glasgow, that an exudation of fibrine very frequently commenced on the surface of the tonsils as the result of inflammation, whence the disease spread downwards to involve the pharynx,



larynx, and trachea, in which it occasioned the phenomena of croup, and too frequently the death of the patient. Mr. Pretty, also, in a paper published in the Medical and Physical Journal, stated that he had often observed, in connexion with scarlatina and malignant sore throat, an inflammation which commenced in the fauces, passed into the larynx and trachea, and there produced the usual symptoms, morbid products, and too often the fatal consequences of croup. Indeed, I believe, there can be no fact better established than the possibility of inflammation of mucous membranes proving sporadic, and extending from any part to the continuously adjacent surface : thus disease may commence with common sore throat, without cough or difficult respiration, and run along the membrane until, reaching the larynx, it produces within it that sort of inflammatory action which ends in the formation of adventitious lymph. Thus far, then, it can be understood that inflammation of the tonsils and fauces sometimes spreads to the larynx, and occasions the symptoms of croup ; that this is met with in some cases of scarlatina anginosa sometimes without such accompaniment ; and, it might be added, that ulcerations of the throat, or even any direct irritation, such as the swallowing of boiling water, may produce a similar result ; the fever that precedes or accompanies such croupy exudation being various in its character, and by no means of necessity inflammatory.

If I understand the views of Dr. Bretonneau correctly, he describes a peculiar and almost specific form of disease, as distinct from malignant scarlatina as it is from inflammatory croup, though resembling the former in the type of its accompanying fever, and the latter in its product of coriaceous lymph. This disease is epidemic : it commences almost universally in the fauces, and spreads downwards to the larynx ; it presents, in the

beginning, the symptoms of angina gangrenosa—towards the latter end, those of croup—and when the patient dies, it is from a mechanical obstruction to respiration. It ought to be regarded as a typhoid form of sore throat, producing occasionally croupy symptoms, but at the same time totally different from the genuine inflammatory croup, in confounding it with which, and in endeavouring to establish an identity between the two diseases, Bretonneau seems to have committed a grievous practical error.

Diphtheritis is epidemic, and in many instances obviously contagious, which inflammatory croup never is; and it attacks adults, in whom it produces a train of symptoms so resembling cynanche maligna, that it is not easy to draw a distinction between the two affections. It consists of an erythematous form of inflammation, distributed in patches over the throat and fauces, on which an exudation takes place, at first of a semitransparent blueish lymph, which afterwards becomes more concrete and opaque, and is easily separable from the surface underneath. This inflammation spreads to the adjacent surfaces, sometimes slowly, sometimes with great rapidity: neither is it a necessary consequence that it should reach the trachea; but when it does, the patient has a stridulous cough with difficult respiration, and dies with many of the physical symptoms of cynanche trachealis. In the progress of the disease, the glands of the neck very generally become enlarged; there is more or less difficulty of swallowing; and there is always an offensive fœtor from the breath, which Bretonneau attributed to a putrid condition of the products of the inflammation, and not to the existence of gangrene in the part itself. This is a disease which never ought to be, and with moderate caution never can be confounded with true inflammatory croup, the two affections being so obviously and so essentially different. The one is a disease of apparent excitement,

the other of evident depression; and when the treatment that might be appropriate for either is considered, it is not a matter for surprise that Bretonneau found (contrary to the received opinion) that bleeding in croup had done harm, and accelerated rather than checked the spread of the coriaceous inflammation. Diphtheritis is (as far as I know) a very rare affection: I have never seen it as an epidemic in children; but during the winter of 1834-5, when scarlatina was extremely prevalent, I met many examples among adults, particularly in cases where no cutaneous eruption had appeared. With these, I need scarcely add, there was no effusion of adventitious lymph, neither did the patients suffer from croupy respiration.

Besides the constitutional treatment, which must be of a nature totally different from that of inflammatory croup, and modified more or less by the type and severity of the fever present, it is desirable in this affection to employ local applications, with a view of arresting the progress of the inflammation and preventing its spreading to the larynx. For this purpose, Mr. Mackenzie advised the parts to be smeared over with a strong solution of nitrate of silver, by means of a camel hair pencil, an application that is extremely useful in other forms of erythematous inflammation; and Bretonneau employed the hydrochloric acid, in a concentrated form, whilst the disease was confined to the mouth and fauces, and by means of fumigation when it had reached the mucous membrane of the larynx. The internal use of calomel is stated to be extremely beneficial in these latter cases; but of its efficacy I have little or no experience.

But the question with which we have most particularly to deal has reference to operation. In this, as well as in all other cases where the patient seems to perish by obstructed respira-



tion, it does not at first appear to be unreasonable to offer him a last chance when medicine and medical treatment have completely failed. Yet this is the very proposition I have laboured to overturn in discussing the propriety of tracheotomy as a remedy for common inflammatory croup; and I think the reasoning which should guide our conduct in that instance ought to be far more influential here. This is a point which every surgeon should consider with the calmest judgment, nor suffer his opinion to be biassed by any authority whatever. Bretonneau states, that he operated on three cases, one of which recovered; and this is a proportion of success so little to be hoped for, and so dissimilar to that which is experienced in cases of a far more promising nature, that it might easily encourage any young practitioner to adopt a similar line of practice.

I have already stated, that I have not seen the epidemic diphtheritis in the child, and therefore cannot speak of it from actual experience. I certainly have seen laryngeal and tracheal inflammation as a sequela of scarlatina and sometimes of measles, more particularly after the sudden recession of either of these eruptions; but I have not been accustomed to regard these as specimens of a peculiar disease, modified by the particular form of fever and by the bad and broken constitution of the little patient. In any case of croup I would not advocate an operation, but still less if the glands of the neck were enormously swollen—if the face was livid—if the tongue was dry and brown, chapped and fissured—and if a putrid odour infected the breath. In such a case it would not be surprising if the patient died during the progress of the operation; and a subsequent recovery would approach so nearly to the miraculous, that a surgeon could arrogate but little of the merit of it to himself. It would be desirable to ascertain whether this practice, incul-

cated in the year 1826, has still been persevered in, and what have been its results. I would hazard a conjecture that it has not; or, at all events, that it has not been eminently successful.

Cases of this description must prove so very interesting to the profession at large, that they would at once have been laid before the public, either through the periodical press or the transactions of some of the medical societies; and in the absence of such evidence, perhaps it is not an illegitimate conclusion, that the practice cannot be recommended.

Diphtheritic inflammation in the adult does not produce symptoms of obstructed respiration, and therefore the operation can never be required.

I have added a few cases to illustrate the pathological varieties generally to be met with in the examination of croupy subjects, but without any hope that they can throw additional light on the treatment of the disease. If medicine and surgery could be learned by a perusal of cases, our knowledge of croup should be extremely intimate, for there is unquestionably no deficiency on this subject to be complained of in professional records; but in general they consist of mere repetition, as if the reiterated statement of a fact could make it more impressive than one single and simple narration. I have also selected a few instances in which the tartarized antimony was used with the most decisive effect, in order to shew the class of patients most easily treated in this way, and the manner in which the medicine was administered. Two cases only have been selected in which the operation was performed, because I deemed it useless to multiply statements, all having a close mutual resemblance, and all, without one exception, tending to the same fatal result.

## CASE I.

INFLAMMATION OF THE BRONCHIAL MEMBRANE WITHOUT  
THE EFFUSION OF LYMPH.

Mary Anne Flaven, a patient of the Dublin General Dispensary, æt. about five years, was suddenly seized with shivering, nausea, dry skin, thirst, restlessness, and other symptoms of fever. She was put to bed, and had some warm drinks given her by her mother. In the course of the night, symptoms of croup set in most violently, and her mother applied for medical assistance early on the following morning.

I saw her in a state of excessive restlessness, tossing herself about incessantly. Her breathing was loud, harsh, and very shrill, indicating that the rima glottidis was nearly closed. Pulse very rapid;—skin hot and dry, with much fever. Cough short and frequent, without expectoration. The child could not speak so as to be understood. The trachea was moved upwards and downwards in the neck, and the inspirations were performed with almost convulsive exertion.

The child was bled—had an emetic—got James's powder with calomel—enemata—warm baths, &c. In short, every thing was done that the urgency of the case indicated, but in vain. She died in the course of the night, thirty-five hours from the time of the accession of the disease.

## DISSECTION.

*Thirteen hours after death.*—This was the only case I had ever met with in which the tumefaction of the mucous mem-



brane of the larynx appeared to be sufficiently considerable to create any serious impediment to the passage of the air. It was red, very much swollen, and had somewhat of the appearance of œdema, but no fluid could be discovered in the sub-mucous cellular tissue. The surface of the membrane in the larynx and trachea was covered with a yellowish soft substance resembling paste, which could be easily scraped off, and the inflammation extended down into the air-cells as far as could be traced. There was an effusion of serous fluid into the trachea, but not in very considerable quantity, nor to the same extent that is generally met with in similar cases.

The other cavities of the body were examined, but no appearance of disease discovered, excepting in the brain, which was very vascular, and there was a small serous effusion within the ventricles.

## CASE II.

Miss E. M., æt. four and a half years. After a slight feverish attack, which lasted a few days, was seized suddenly at night with symptoms of croup, difficult breathing, but without much muscular exertion, dry, hard, frequent cough, with the peculiar ringing sound. Her skin hot and dry—tongue foul—pulse 140. The most unpleasant symptom in this case was constant restlessness. She tossed herself about, and changed her position every moment, and was peevish when her desires in this respect were not complied with.

This child was bled with leeches applied to the throat externally, and it was surprizing the quantity of blood she lost without appearing to be generally debilitated. The internal treatment consisted principally of emetics, but nothing seemed for a

moment to arrest the progress of the disease: it gained ground rapidly, and she died comatose at the end of thirty-four hours from the commencement of the attack.

#### DISSECTION.

The larynx appeared in its perfectly natural state, except that there was some frothy mucus entangled in its ventricles. There was no trace of any adventitious membrane whatever. Immediately below the larynx, the trachea was inflamed, red and pulpy, and the intensity of colour seemed to increase as it proceeded downwards towards the lungs. The air-cells and trachea were filled with a serous fluid of a reddish or brown colour, and, on the thorax being opened, the lung did not collapse.

An examination of the head was not permitted.

#### CASE III.

*June 11, 1824.*—Eliza Doyle, æt. two and a half years, residing about four miles from Dublin, was brought to me on account of symptoms of croup having manifested themselves. She had been some time previously covered with eruption, which had been suddenly repelled; and during the week before the difficulty of breathing commenced, she was dull, heavy, and languid, with dry, hot skin, restlessness and unwillingness to take food. She breathed without much muscular exertion, but with a harsh ringing sound; a dry cough without expectoration, and there had not been any spasmodic exacerbation.

Two leeches were applied to the throat, which bled very profusely, and she was so much relieved that her mother neg-

lected to bring her to the hospital next day. In the evening, however, the difficulty of breathing increased, with something like a convulsion, and she passed the night extremely ill.

*June 13.*—She was again bled with leeches, and relieved; and her mother had opening medicines with calomel and antimonial powder to take home with her, as she was so frightened at the idea of the child being received into the hospital (which had been proposed to her), that she positively refused to bring her again.

*June 15.*—I saw the child in the country; symptoms remaining pretty nearly as before. The mother stated that she had a regular convulsion every evening, accompanied with excessive difficulty of breathing, and great restlessness throughout the night, but that she was comparatively easier during the day.

*June 16.*—On the recommendation of some person in the neighbourhood, the child's mother placed a blister on the infant's neck and chest. From this moment there was not a moment's intermission of the difficulty of breathing until the evening of the 18th, when she was seized with a slight convulsion, and died.

#### DISSECTION.

*Twenty-four hours after death.*—The trachea amazingly full, of a reddish or brownish-coloured fluid mixed with froth. The entire mucous membrane of the larynx, trachea, and bronchiæ, as far as it could be traced, was swollen, pulpy, and of a bright cherry-red colour. There was no effusion of coagulating lymph, no formation of any adventitious membrane, nor did there appear any apparent mechanical obstruction to the passage of the air.



On the thorax being opened, the lungs did not collapse. The brain was not examined.

#### CASE IV.

##### CROUP WITH EFFUSION OF LYMPH.

Julia Quinn, a patient of the Dublin General Dispensary, æt. about five years: fat, and apparently of a healthy constitution. On the 17th of November, 1820, this child was brought to the institution as an extern patient by its mother, who stated that she had been ill during the nine preceding days. She had at first a slight, hard, dry cough, which was not attended to, and occasional paroxysms of difficult breathing, described by the mother as convulsions. During the last two days her powers of articulation were much impaired, and the cough had increased in frequency. On the evening preceding her appearance at the Dispensary she had coughed up a small portion of viscid lymph streaked with blood, but no other expectoration had been seen.

When I first saw her she had extreme difficulty of breathing, with a loud, harsh, sibilous noise; loss of voice; frequent hard cough; great restlessness; *face swollen\**; *eyes apparently protruded, and quite pale*; *lips livid*; pulse very quick and small; skin hot and dry.

Venesection from the jugular vein to ten ounces.

Two grains of calomel with one of antimonial powder, to be taken every second hour.

The bowels to be freed by a turpentine enema.

A warm bath in the evening.

\* These symptoms may be regarded as indicative of a congested state of the lungs, and of course fatal.

Nov. 18.—Not in the least relieved; has had what her mother called convulsions twice during the night; difficulty of breathing greatly aggravated; cough incessant; restlessness rather increased, as she tosses herself about in every possible direction; pulse and skin as yesterday.

The calomel and antimonial powder to be continued.

A large blister to be applied to the chest.

On visiting this patient in the evening, I was informed she had had another convulsion, and I found her sinking rapidly. Her eyes seemed fixed, her limbs cold, and her pulse faltering. She died in about an hour afterwards.

#### DISSECTION,

*Eighteen hours after death.*—On opening into the larynx and trachea, an immense quantity of serous fluid ran about, which had apparently been poured out by the bronchial cells, yet there was not the slightest trace of inflammation of the mucous membrane of the trachea as far as it could be followed downwards. The lungs were gorged and loaded with blood, and were more solid to the touch than usual. The serous surface of this organ was studded over with small greyish tubercles, like grains of fine sand, scattered thickly over its entire extent. There was a quantity of dark-coloured blood in the right side of the heart.

The internal surface of the larynx was covered with a thick, coriaceous layer of lymph, partly attached, partly flocculent, and floating into the cavity. Nothing like ventricles or chordæ vocales could be seen, so that the configuration of the organ was completely spoiled.

Part of the detached lymph had floated away in the fluid which had escaped from the trachea. The mucous membrane, in any place where the lymph could be separated from it, was red (rather of a pink or pale carmine colour) and slightly thickened, and the disease was accurately confined to the larynx.

### CASE V.

M. A. King, æt. seven years, a fat and hitherto healthy child, was suddenly attacked on the evening of the 10th June, 1819, with difficult breathing, attended by a loud ringing noise, which could be heard at some distance.

On the next day the difficulty of breathing had increased, accompanied by short cough of a harsh sound, and without expectoration. Her voice was nearly lost, but, as well as she could explain her sensations, she principally referred her uneasiness to a feeling of tightness or constriction in the chest. She had occasionally severe spasmodic exacerbations, and writhed and struggled excessively during their continuance. On this day, an emetic was administered with some apparent relief: she was bled from the jugular vein, an operation attended with more than usual difficulty, on account of the fat condition of the patient. She took twelve grains of calomel in divided doses, and a purgative enema was administered with effect.

During the night the patient seemed somewhat relieved, and did not suffer from spasm; but on the following morning all the symptoms became greatly aggravated. The cough was incessant, but still without expectoration; the voice quite indistinct; the pulse very rapid, small and irregular; the countenance of a



blueish paleness, puffy and swollen ; and the lips purple. She was now largely bled by the application of leeches, and the medical treatment continued, with the addition of the warm bath, but without the smallest relief.

In the evening a large blister was applied over the throat, and another between the shoulders. These blisters never rose, and about midnight the patient was seized with a terrific spasm, amounting almost to convulsion, after which she lay insensible, and died in the space of an hour afterwards, fifty-one hours after the first appearance of her illness.

#### DISSECTION,

*Eight hours after death.*—On slitting up the trachea and larynx, the entire of the mucous membrane seemed covered by a thick irregular layer of adventitious lymph, of a tubular form, but broken down in parts, so as to destroy the perfect shape of a tube. This was thicker and more adherent towards the back of the trachea than anteriorly. It was more firmly attached in the larynx than elsewhere. Wherever the adventitious membrane had been completely separated from the surface underneath, this latter was of a pink or light carmine colour, but when picked off, where its attachment was more firm, the mucous membrane presented a very deep tint of dark scarlet.

The trachea was nearly filled up with a reddish-coloured serum, containing flakes of lymph which floated off as the fluid ran from the wound. The lungs were more firm to the touch than usual, and gorged with dark-coloured blood. There was effusion of serous fluid into the pericardium, and a more than ordinary quantity of dark blood at the right side of the heart. The brain was not examined.

## CASE VI.

## CROUP SUCCESSFULLY TREATED.

William Adams, æt. 7 years, a pale and apparently sickly child, had suffered for some time from infantile remittent fever, and was becoming convalescent when he was suddenly seized with symptoms of croup. At first he had only the short frequent cough without expectoration, but every cough seemed to produce a spasmodic action in the muscles of the larynx, for the inspiration following was laboured and attended with a crowing sound. Although there was nothing like a paroxysm of cough, this affection was mistaken for whooping-cough, and treated as such during two days; at the end of which time the peculiar ringing sound of the breathing, with the great difficulty of carrying on the function and other symptoms, left no doubt as to the nature of the affection present.

When I saw him, he breathed with extreme difficulty; he had the croupy cough, the sonorous breathing, and the larynx was moved upwards and downwards in the neck by an almost convulsive action of the muscles. His chest did not seem to be affected; his face was very pale; his lips of a colourless transparency, but not blue; he had no marked exacerbation of dyspnoea, nor any convulsion.

I ordered for this child two grains of the tartarized antimony in eight ounces of water, and to take 2 desert-spoonfuls of the solution so as to produce nausea, but not vomiting. In order to insure the operation of the medicine, I placed the patient under the immediate care of one of my pupils, who administered it

himself and watched its effects. After the second dose, which was given in an hour after the first, the child became very languid and fell asleep, an effect which I have constantly seen to follow the nauseating operation of the medicine. It was not necessary to repeat the dose until after an interval of six hours, and by keeping the little patient thus in a state of extreme sickness and debility during forty-eight hours, there was no further trouble with the case. The child recovered perfectly.

### CASE VII.

Master D. L. G., æt. 9 years, was suddenly seized about 12 o'clock on the night of the 23d of January 1826, with symptoms of acute croup. The sound of his breathing could be heard outside his room : his cough was incessant, dry, harsh, and ringing. His pulse very rapid. His skin hot. He complained of some thirst, and was excessively restless, wishing to be raised in the bed.

I saw him within an hour after the first appearance of the disease, and immediately opened the jugular vein. From this but a small quantity of blood flowed, and I determined on bleeding him from the arm. After a short time he became very sick and faint, but did not vomit. The difficulty of breathing was relieved, and he fell asleep, occasionally coughing as he lay ; but the character of the cough seemed changed, and its frequency much diminished.

Towards morning the symptoms returned, but not with their former severity : however, the breathing was decidedly croupy, and the cough exceedingly annoying. I determined then on



giving the tartarized antimony, and placed one of my pupils by the bedside of the patient, to administer the medicine, and watch its operation. A single spoonful of a solution similar to that ordered in the above case made the child very sick, and he fell asleep. After an interval of four hours the dose was repeated, and again in five hours afterwards. The difficulty of breathing had now entirely subsided, but the cough remained; however its peculiar ringing character was removed, and it only occurred at intervals. The medicine was continued during the following day, after which the boy became completely convalescent.

### CASE VIII.

James Doyle, aged three years, the son of a dairy-woman, living in the neighbourhood of Dublin, was attacked about four o'clock in the morning of the 7th July 1825, with symptoms of acute croup. His mother saw me on the road passing her door about eight o'clock, knew me, and requested I would see her child, who, she said, was dying of quinsy.

The boy lay in a woman's arms, breathing with extreme difficulty: the sound of the respiration was harsh and sonorous; he had incessant cough without expectoration; his face was pale and apparently swollen; his eyes seemingly protruded; his lip pale and transparently clear, as if it contained no blood, but not purple or discoloured. The trachea was moved violently upwards and downwards in the neck, and the chest heaved with frequent and almost convulsive exertion.

There was a dispensary in the neighbourhood from which a solution of the tartarized antimony was immediately procured,

in the proportion of one grain to eight ounces of water, one table-spoonful to be given every second or third hour.

On my return in about two hours afterwards, I found that the first dose had produced vomiting, and the child was now asleep and apparently relieved. I desired that the medicine might be repeated in half the usual quantity after the interval of an hour, and, if the child became very sick, that its use should be suspended until I saw him again.

The next day I learned, that the child had awakened with symptoms nearly as severe as ever; but on the administration of the medicine that he fell asleep again. A third dose was given about seven o'clock in the evening, and during the night frequent discharges took place from the bowels of green fetid matter. When I saw my little patient, the difficulty of breathing had been completely removed, although the cough remained still harsh and ringing, but diminished in frequency. The cough now occurred in paroxysms of longer duration, and occasionally he expectorated a thick mucus, which was got up with much difficulty. I directed the medicine to be continued, and on the following day I found the child convalescent. The cough, however, lasted for some time longer, diminished in severity and materially altered in its character.

This child has since experienced another attack of croup, which has been milder in its symptoms, and successfully treated by the same remedies.

## CASE IX.

Pat. Finley, æt. five years, admitted into the Meath Hospital on the 7th March, 1826. Had been attacked with cough and difficulty of breathing on the 4th, without any previous sickness. His symptoms at the time of admission were, cough without expectoration, coming on at irregular intervals of from two to five minutes; croupy respiration, but not very sonorous; pulse very quick; the thorax heaving; the alæ of the nose distended; the eye white and full; and the lips of their natural colour and brightness.

The stethoscope was used for the purpose of ascertaining the state of the lungs and windpipe. Diagnosis,—lungs quite healthy; inflammation of the bronchial membrane nearly as far down as the bifurcation of the trachea.

This child was treated with the tartarized antimony, in doses of the eighth part of a grain every third or fourth hour. The first dose produced an emetic effect, and it was not repeated during that day.

*Mar. 8th.*—The symptoms were all aggravated; difficulty of respiration increased, with extreme restlessness. The medicine was continued, and the resident pupil desired to watch its effects, so that, if possible, the child might not again vomit. In the course of the night it acted on the bowels, and there were three or four green-coloured stools, extremely fetid.

*Mar. 9th.*—The frequency of the cough has diminished, and there was some expectoration, but the croupy breathing remained,



and was particularly remarkable while he slept. The stethoscope indicated a diminution of the inflammation.

*Mar. 13th.*—The medicine has been continued to this day, but may now be laid aside. The child sleeps quietly, and breathes with the utmost freedom. The cough entirely removed. The complexion has returned, and he may be considered as completely recovered.

### CASE X.

Honor Buckley, æt. three years and a half. Took ill with measles eleven days before her admission into the Meath Hospital. The eruption came out well, and was going on favourably until the third day, when it suddenly receded. About an hour afterwards she became hoarse, lost her voice, and could speak no louder than a whisper. The respiration became rattling and sonorous, with short, clanging cough, without expectoration.

At the time of admission the symptoms of croup were very well developed, and there were some appearances of fever; skin hot and dry, and accelerated pulse. The complexion, however, was clear, and the lips of their natural colour. She was put under the influence of nauseating doses of tartarized antimony, and the effect, in this instance, was surprising. At first she became very sick, but did not vomit, and soon fell into an undisturbed sleep. The medicine was persevered in, and on the fourth day the child had completely recovered. There was a slight blush of redness over the face, as if of some eruption coming out, but nothing like measles re-appeared while she remained in the hospital.

## CASE XI.

## BRONCHOTOMY EMPLOYED FOR THE CURE OF CROUP.

Miss E. K., an interesting little girl about five years old, was attacked on the 10th May 1824, with short, troublesome cough, without expectoration, but the inconvenience was so trifling that at first it was not attended to. On the 11th some imperfection of voice appeared, with occasional spasmodic difficulty of breathing, and the cough increased. This latter symptom was peculiarly spasmodic, and along with the dyspnœa presented such characters as to render the disease like to whooping-cough, for which it was actually mistaken by the first practitioner who saw the child.

On the 12th and 13th the abovementioned symptoms had increased, but so gradually as not to cause alarm until the evening of the latter day, when an access of fever, followed by dreadfully spasmodic difficulty of breathing, reduced the patient to a condition truly alarming.

On the 14th Mr. Hewson saw her, and found her in a state that decided him at once on performing tracheotomy as the only means by which a chance of life could be offered. The operation was performed, to which the little creature cheerfully submitted, in the hope of being freed from the uneasiness she suffered; and when it was completed, she appeared to be much relieved, and fell asleep, quietly breathing through a canula introduced into the trachea.

On the 15th she seemed to be improving rapidly; she was recovering strength, and able to sit up in bed; but was teased

with the quantity of mucus she was obliged to expectorate through the wound, and which she was scarcely able to expel. An assistant constantly sat by the bedside, and quickly removed this as fast as it was thrown into the wound. Her pulse had fallen considerably in frequency: she had some appetite, and ate a little light food with apparent relish. Her sleep, however, was disturbed every four or five minutes by the necessity of getting rid of the mucus, which was constantly accumulating.

On the 16th she appeared to be still improving, and hopes were entertained that she would ultimately recover; but on the evening of the 17th (the fourth day after the operation) symptoms began to shew themselves that promised rather an unfortunate result. About 4 o'clock, P.M., the mucus accumulated in such quantity that she became unable to relieve herself, and, but for the uncommon assiduity of the assistant, she must have been suffocated. After this struggle she sank with great rapidity; she seemed to dilate her chest with pain, and breathed convulsively even through the artificial opening. The pulse faltered—the rattling of mucus in the trachea increased, and she died about twelve o'clock at night.

I have not deemed it necessary to prolong the relation of this case by detailing the medical treatment, as it has been introduced only with reference to the operation as a mode of cure, and on account of the interesting appearances observed on examining the body.

#### DISSECTION,

*Eleven hours after death.*—The mucous surface of the larynx seemed entirely altered in structure. It was of a yellowish opaque colour, granulated, and in parts having flocculi of lymph



floating into the cavity of the organ. When any of these minute patches of unorganized lymph were detached, the surface underneath appeared thickened and altered, but not red. There was no trace of ulceration. The ventricles were obliterated, and the figure of the organ altogether spoiled. The boundary of this disease was abrupt, and confined entirely to the larynx, terminating exactly at its inferior edge. The trachea was filled with mucus, frothy, and of a reddish colour; and about half an inch below the situation of the wound caused by the operation a blush of inflammation was perceptible, which increased in intensity as it descended lower in the tube. The mucous membrane of the bronchiæ was red, swelled and puffy, and slightly smeared over with a yellowish substance resembling paste. Thus above an inch of the extent of the trachea situated between the two diseases was left completely unchanged and healthy.

The head was not examined.

## CASE XII.

Emily Toole, a fat little girl, aged about  $3\frac{1}{2}$  years, was attacked with croup on the 10th of June, 1821. As she lived at some distance from Dublin, she had no medical aid until the following day, when her mother brought her to town, and, objecting to go into the hospital, took a private lodging for herself and child.

This was a form of disease seemingly very acute in its symptoms, and promising to be rapid in its progress. The child's lips were already livid and purple; its cheeks apparently swollen, and very pale; its eye prominent, white, and bloodless; the veins of its neck occasionally greatly dilated, and the actions of the muscles of respiration almost convulsive; the

pulse very small, like a thread under the finger, and so rapid as scarcely to be counted; the cough incessant, and the breathing hard and sonorous.

This was a case in which medicine held out but little hope, and the operation was resolved on, without much expectation of success, but to give the patient a chance of her life. At the first incision some superficial veins were wounded, which poured out blood in fearful abundance. The child could not cry, but it struggled violently, and these struggles increased the hæmorrhage to an apparently alarming extent. However the operation was proceeded in with considerable difficulty, the parts being obscured by blood, and each stroke of the knife being made in uncertainty as to what might be under its edge. Some of the thyroid veins were wounded, and this still added to the hæmorrhage; nor was it deemed advisable to open the trachea until after the lapse of half an hour, lest the flow of blood into the windpipe should suffocate the patient. At length the child seemed to be sinking, although, in consequence of the application of sponges and pressure, it had not lost a very great quantity of blood: its face became pale and exsanguine, and its eye fixed; its respiration calmer, but the efforts of the muscles in the neck could be distinctly seen, and the larynx was moved up and down, although much slower than before. In this state a small portion of the trachea was excised, and the child coughed and struggled, and expelled some bloody mucus by the wound with more strength than it was supposed to have possessed. The difficulty of respiration was removed, and it fell asleep in half an hour afterwards.

In the evening the child had rallied a good deal, but it became apparent that the operation had accomplished nothing.

The cough was incessant, and the efforts to expectorate violent, but unsuccessful. When any mucus was thrown into the wound, it was instantly sucked back again by the next inspiration, and the cough and distress renewed. The rattling of the mucus in the windpipe became audible at some distance, and an attempt to relieve this by the application of a syringe to the wound failed entirely. The child became weaker every moment, was stupid, almost comatose, and died about twelve hours after the operation.

On dissection, it was difficult to discover the veins which had bled so freely during life, and given so much trouble in the operation. The thyroid veins did not unite into a common trunk, and only one branch could be seen, slit up nearly its entire length, but then so minute that it could hardly have been supposed capable of pouring out much blood. The connecting slip between the lobes of the thyroid gland had been divided, but no arterial trunk had been injured in the least. The hæmorrhage, therefore, seemed to have proceeded entirely from the surface of the wound.

The larynx had, in this case, been the seat of the disease, and was covered with a thick layer of adventitious membrane, which seemed nearly capable of blocking up the rima altogether.

There was no trace of inflammatory action in the membrane around the incision that had been made in the operation.

Just at the bifurcation of the trachea the membrane began to assume a red colour, which was continued downwards. The lungs seemed a little firmer than usual, and sections made into their substance produced an oozing of dark-coloured blood.



There was considerable effusion into the bronchial cells and bronchiæ.

The bag of the pericardium contained, perhaps, less than half an ounce of serous fluid: the heart itself seemed healthy; but there was dark blood in each of its four cavities.

This case presents a view of some of the difficulties attendant on the operation of tracheotomy in the child.

### LARYNGITIS ŒDEMATOSA.

History—Pathology—Exciting causes—Symptoms—Treatment—  
Question of Bronchotomy discussed—Cases.

It is no inconsiderable proof of the defective state of pathological knowledge in general, that a disease so very fatal as this, and certainly not so infrequent as to justify ignorance on the subject, should have been so recently as the year 1808 viewed with all the interest of a new discovery. It is probable that previous to this period, whenever an example of œdematous laryngitis occurred, it was regarded as a case of croup occurring in the adult; for we find\* that one of those physicians who lost their lives by this affection in the year abovementioned, declared that his disease was to be considered as croup. Since that time, however, such a multiplicity of cases have been published as ought to be sufficient to satisfy every man that any deficiency as to the pathological nature of the affection must have arisen rather from an inattention in investigation after death than from any paucity of subjects.

\* Med. and Chir. Transactions.

It appears not improbable that this form of disease was known to Hippocrates\*, as he speaks of angina, in which the eyes are affected and prominent, as if the patient was strangling; the face, throat, and even the neck in a state of inflammation, and yet no appearance of disease discoverable by examining the fauces. Galen† also mentions an affection of the throat producing suffocation, and alludes to Asclepiades, as placing his chief reliance on opening the larynx in such cases. Paulus Æginetus, too, speaks of a quinsy requiring bronchotomy for its cure; but as, in describing the operation, he seems to think it called for in those cases where the inflammation lies chiefly about the throat, the chin, and tonsils, there may be some doubt entertained as to whether he was acquainted with this exact species of laryngeal affection. It is, probably, the disease mentioned by Boerhaave under the name of angina aquosa: but that it is a malady by no means novel in the history of medicine may be proved by reference to M. Louis's‡ paper in the *Memoirs of the Royal Academy of Surgery*, which contains some excellent observations on its symptoms, its progress, and the necessary mode of treatment. However, in the works of these authors, or indeed of any other, I do not find any direct account of the disease in question, or any explanation of its exciting causes, and the morbid changes induced within the parts affected; and it is principally by referring to cases published for the purpose of shewing the advantages of bronchotomy that a knowledge of its symptoms and characters can be acquired.

The seat of this affection is more in the cellular tissue con-

\* Hippocrates de Morbis. lib. 3, cap. x.

† In Medico, cap. xiii.

‡ De la Broncotomie.

necting the mucous membrane to the adjacent parts, than in the membrane itself, although this latter structure is very frequently found to have been inflamed. This tissue is reticular\*, and the effect of inflammation upon it is to cause an effusion of serous fluid within its cells, and thus to create, by approximating the sides of the rima glottidis, a directly mechanical obstruction to the passage of the air to the lungs. It is evident now, that the danger of such an affection must be proportioned to the quantity of effusion that takes place, and the rapidity with which it is formed, so that a patient may be quickly suffocated by the complete closure of the rima, or he may be left to struggle, during three or four days, with partially obstructed respiration, and finally perish of congestion in the lungs and brain. When inflammation of the mucous membrane has accompanied this affection, I cannot find any satisfactory examples of its having extended beyond the larynx, and into the trachea: on the contrary, the chief intensity of disease has been in the epiglottis, which is found red, erect, thickened, and swollen, and during life has been seen to resemble a piece of raw meat. It is not, however, easy to procure a view of this part, particularly if there is inflammation of the fauces accompanying that of the larynx; but it can, in the great majority of instances, be felt by introducing the finger downwards into the throat. The sensation it affords is that of touching a round and solid body possessing the size, smoothness, and consistence of a cherry. In making this examination it is always desirable to pass the finger, if possible, beyond the epiglottis, for its lingual aspect is frequently free from disease, whilst its laryngeal surface is swollen, and greatly enlarged by serous infiltration.

The exciting causes of this affection appear in nowise to

\* See page 6.



differ from those of inflammation in general: chiefly they seem to be exposure to damp, to cold, the passing from a warm temperature into the night air, and sudden variations of season. It does not appear that persons of any age are wholly exempted from it after puberty, as I have known it to occur and to prove fatal in more than one young subject: but it is most frequently to be met with in persons of a more advanced age; in men more than in women; in large plethoric people who have led a sedentary life, and indulged in the pleasures of the table: and there is some reason to suspect a predisposition to this disease in those patients who suffer severely from sore throats on the slightest exposure to cold. It is sometimes the result of sporadic inflammation, and follows its occurrence in some of the neighbouring parts;—it is also to be met with in connexion with *cynanche tonsillaris*; but most frequently there is no appearance of co-existent inflammation in any surrounding structure. It is also, occasionally, very insidious in its approach; and I have two instances within my own recollection of young men who had retired to bed at night without complaining, and were found dead from this affection on the next morning.

The symptoms of acute *cynanche laryngea* might almost be enumerated from considering the morbid actions that have taken place, and the changes produced by them. They may, with reference to the treatment of the disease, advantageously admit of division into two classes: first, those merely indicating the existence of some mechanical obstruction which prevents the lungs from receiving a sufficient supply of air; and, secondly, those shewing a state of congestion in the lungs, and, perhaps, in the brain.

The former of these will present some variety, according as the disease may happen to be complicated with other inflam-

matory affections. In general its attack is sudden, but it may be otherwise; and if it be preceded or accompanied by cynanche tonsillaris, there will be previous shivering, nausea, headach, loss of appetite, heat and dryness of skin, with accelerated pulse, and other symptoms of inflammatory fever. Along with these there will be a greater or less difficulty of deglutition, redness and swelling of the fauces, and enlargement of the tonsils. The occurrence of such symptoms as these may possibly lead the practitioner astray, if it should induce him to suppose that the difficulty of breathing arose from the inflammation of parts surrounding the larynx, and that the mischief was not situated within the organ itself. It is asserted on high authority\*, that a combination of difficulty of deglutition with obstructed respiration forms the essence of this disease; but it by no means follows that there should be any imperfection in the act of swallowing; for the larynx may be totally blocked up, so that scarcely a particle of air shall pass through it, and yet every part of the fauces be found after death to have been entirely free from disease.

At first this affection makes its appearance with difficulty of breathing, and a sense of dryness or huskiness in the throat, which obliges the patient to cough frequently in order to get rid of what seems to be an extraneous source of irritation. This increases rapidly, and he is obliged often to draw a full inspiration in order to inflate the lungs, and in doing so there is a painful sensation of constriction about the windpipe. Soon the respiration becomes sonorous and laboured. There is a peculiar sound caused by the air forcing its way through the contracted aperture, which cannot be described, but which, once heard, can never be mistaken. It is harsh, sibilous, or whistling—accom-

\* Sir G. Blane. *Medico-Chir. Transactions*, vol. vi.

panies each act of inspiration, and is less distinct or perhaps wanting in expiration. The patient now becomes excessively anxious and uneasy: he has a strong disposition to slumber, and perhaps sleeps for a moment or two, but soon starts up in all the horrors of impending suffocation. His face is flushed; his eyes protruded, as if starting from their sockets; his lips swollen, but pale, and as if transparent; the larynx and trachea are moved quickly upwards and downwards in the neck, and all the muscles of respiration are brought into almost convulsive action, so that the chest heaves violently. At this time the patient cannot lie down, partly because the position is uneasy, and partly because he dreads falling asleep, and the horrible sensations with which he awakes. He will be generally found walking about, occasionally going to an open window with a view of inhaling purer air, and sometimes stopping to grasp a chair, or any other body which may serve to fix his arms, and thereby bring into action additional muscles to assist the process of respiration.

In this stage the patient's voice is greatly impaired, but it is rather an inability to articulate at all than what is usually termed hoarseness. When asked as to the seat of his uneasiness, he points to the *pomum adami*. He is subject to dreadful spasmodic exacerbations, in which all the symptoms are aggravated, and the sweat pours off his forehead in abundance. The pulse at all times indicates the presence of irritation, being above 100, and occasionally 120, small, quick, and vibrating.

It would be difficult to determine, on seeing a case of this description, whether the symptoms arose from the actual presence of inflammation in the mucous membrane of the larynx, and its becoming consequently thickened and swollen and pulpy, or whether they were occasioned by the effusion of serum within



the submucous tissue. Yet a material difference of practice would depend on such discrimination, if it could be accomplished; for if the disease be purely inflammatory, unaccompanied by any mechanical obstruction, the great probability is, that it will be relieved and ultimately removed by bloodletting and other measures of depletion, whilst, if the effusion has taken place, the object will no longer be to check inflammation, but to remove certain effects of it which have already been produced. Very many cases\* are related of acute cynanche laryngea successfully treated by the usual means of combatting inflammation; but it may reasonably be doubted whether these measures would be efficacious in producing an absorption of serous fluid once effused, although they might arrest the progress of the disease, and thus prevent its being thrown out at all. Perhaps cases of sporadic disease which have commenced in the palate, the tonsils, or the fauces, are those most likely to be benefited by such treatment; but it must be remarked, on the other hand, that in many of the cases which recovered without operation, it is distinctly stated that no trace of inflammation could be discovered on examining the throat.

But the great probability is, that the majority of cases are those in which the morbid action is seated in the subjacent cellular tissue, and then the effusion takes place with such rapidity that the disease is hardly formed until the mechanical obstruction is produced. And this opinion is strengthened by the remark of Mr. Lawrence, that “bleeding, blistering, and the

\* See Case by Mr. Wilson—*Medico-Chir. Transactions*, vol. v, p. 156; also a case by Dr. Arnold, vol. ix, p. 31, of the same work.

Ed. Med. and Surg. Journal, vol. x, p. 284, a case by Mr. Anderson, treated successfully by bleeding and the use of tartarized antimony.—See also Dr. Roberts’ case in *Medico-Chir. Transactions*, vol. vi, p. 135. This case is particularly interesting, as the person who was the subject of it died of another attack of the same disease fourteen years afterwards.

usual means for subduing inflammation, are here found totally inefficacious," for not one of these will be of the least use in removing the effused fluid, however powerful they might prove in checking inflammatory action. The only manner, then, in which we can reasonably promise safety to our patient is to procure for him some mode by which respiration can be carried on other than the larynx, which is no longer competent to the performance of its functions, and thus afford time either for the spontaneous subsidence of the disease, or its removal by medical treatment.

Besides the uncertainty that must prevail as to the precise nature of the morbid action that is going forward in acute laryngitis, and the consequent hazard a practitioner will run of losing his patient whilst he is attempting a treatment that may be unsuccessful, there are many reasons why he should, in the present instance, decide at once on performing bronchotomy. Thus, it allows the organ in which the diseased action is situated to remain in a perfect state of repose. It takes the place of treatment, which, besides being injurious from the loss of time, is often in itself positively detrimental. Considered as a wound, it adds but little to the patient's danger; and as the relief it affords is, at least for some time, complete, it imparts confidence to the surgeon, and allows him more leisure to examine the symptoms, and adapt his remedies accordingly.

Acute cynanche laryngea is a disease which runs its course very rapidly, and often terminates in the course of a few hours. If bloodletting be resorted to, it should be adopted to a large extent, and without delay; and if it produces a decided alleviation of symptom, and is followed by the exhibition of tartarized antimony, so as to keep the patient in a state of depression during several hours, the case will probably terminate favourably.

But this will not be likely to happen if a serous effusion has already taken place in the submucous tissue, and then it will be injurious, inasmuch as patients who suffer from obstructed respiration soon become weakened in vital energy, and sink with wonderful rapidity. Persons who have their minds strongly directed to any one particular object are thereby less likely to be affected by medical treatment; and therefore, if a man be under extreme anxiety to maintain respiration, and thinks that bleeding will afford him relief, it is probable he will lose a large quantity before it produces syncope. I have known an instance in which the veins of both arms were opened, where the patient suffered from cynanche laryngea; and although above forty ounces of blood were drawn *pleno rivo*, yet he never became weak or sick under the operation. But it was very near to have proved fatal afterwards, for in the course of an hour he shewed symptoms of extreme debility: his pulse faltered; his extremities became cold, and it was only by great care and exertion that his life could be preserved\*. However, under all circumstances, bleeding is the least hazardous of any mode of treatment, because it can be tried without any delay, and its efficacy is perceptible at once. If, therefore, after a large quantity of blood had been drawn, no alleviation of symptom became observable, it would form strong grounds for suspecting that the cause of the difficult breathing was mechanical, and be an additional reason for resorting to the operation without unnecessary loss of time.

In like manner, it may be objected to every remedial treatment, whether local or constitutional, that if the effusion into the submucous tissue has taken place, every moment suffered to

\* See Dr. Cheyne's Observations on Bloodletting in Laryngitis, in the Cyclopædia of Practical Medicine.



elapse before an artificial opening is established must be pregnant with danger. The lungs very soon become oppressed, and incapable of effecting the arterialization of the blood; and if the brain is supplied with a fluid not suited to the purposes of maintaining its functions, its vessels become congested, and a diseased action is commenced, which even the subsequent establishment of free respiration will not remove. This is a fact well illustrated by persons who have attempted to commit suicide by hanging, and been discovered before the vital spark has been completely extinguished; for many of these, although respiration has been perfectly restored, have died with symptoms of oppression of the brain, perhaps in a week after the deed has been committed; and, on dissection, nothing has been found except venous congestion in the cerebrum, with a slight effusion on the surface under the arachnoid membrane. It is thus that bronchotomy so frequently proves unsuccessful in the treatment of acute laryngeal affections\*; for as during the first stage the patient's strength remains unimpaired; as he is able to walk about and use considerable exertions in endeavouring to procure relief; and as he enjoys the perfect use of his sensorial faculties, the degree of danger is seldom appreciated in time, and the operation is postponed for the trial of antiphlogistic remedies, until such disease has been induced in the lungs as will render every subsequent effort entirely unavailing.

It is very possible that a patient may perish during the first stage of this disease, being strangled by a spasmodic action of

\* On pratiquera toujours la broncotomie trop tard dans cette maladie, qu'on assure être inévitablement mortelle, si on ne l'admet que comme un moyen extrême : l'opération sera souverainement utile quand on y aura recours dès le commencement de la maladie afin de prévenir l'engorgement du poulmon.—LOUIS.

the muscles of the larynx, and thus die *constante mente integrisque sensibus*: indeed, the unwillingness a patient feels to make an attempt to swallow, which always brings on a spasm, or sometimes even to speak, shews that he is sensible of the danger attendant on spasm, quite independent of the fearful distress it occasions. But it is not thus that the disease terminates in general; for, after the difficulty of breathing has continued for some time, the patient's countenance becomes swollen and of a livid paleness,—the eyes are pearly white and suffused, as if an exhalation had taken place from the conjunctiva, and dried upon the membrane;—the lips are purple;—the disposition to slumber increases, whilst the extreme anxiety of the patient to maintain respiration and his efforts to carry it on are increased. Every muscle that can be brought into action is forcibly employed, whilst the sound of the breathing is altered, and there is a kind of sob of distress accompanying each expiration. The sweat pours over the face and forehead, and perhaps from the entire body. Sometimes the patient becomes inconceivably restless; whilst again he may remain quiet, apparently under the influence of hopeless despondency. The pulse very generally increases in rapidity.

After these symptoms have endured a few hours, the patient is observed to make less violent efforts to support respiration, and the intervals between each act are longer. The want of accordance between this function and circulation becomes more apparent; for the pulse is very small and increased in frequency, and often immediately before death it is so rapid that its strokes cannot be counted. The breathing seems to be more a convulsive effort than a regular action, and is sometimes accompanied by stertor. The countenance becomes sunken, the eye loses its brilliancy still more, and the forehead is bedewed

with a cold and clammy sweat. The patient becomes insensible, and death soon closes the scene.

It is perfectly evident, that, when symptoms such as these are observed, no treatment whatever, either surgical or medical, will be likely to save the patient, although it may be possible to prolong his existence during a few days by performing the operation, for it seldom or never fails to afford a temporary relief; and this is a circumstance worth the consideration of the surgeon, if the patient's situation is such as to render a slight prolongation of life desirable. But beyond this point it must be totally unavailing, and affords an instance of the danger of procrastination, under the idea of trying the effect of other measures; for at any time previous to the occurrence of congestion in the lungs, the operation will almost certainly save the patient's life, and at any time subsequent it will as surely fail of accomplishing the end desired.

It may still be objected, that many cases have recovered without resorting to an operation which, however simple and easy of performance, is at all times viewed with terror by the uninformed spectator, and, moreover, is strongly opposed by authority of the most respectable nature\*. And the objection would bear very materially on the case, if the surgeon could distinguish a case of common inflammation from that occasioned by effusion into the submucous tissue, or if he could be aware

\* The celebrated Desault seemed not at all friendly to the operation of Bronchotomy, which he calls "*une operation toujours facheuse*," and has recommended the introduction of an elastic tube into the trachea through the nostrils in almost every case wherein this operation used to be practised. He acknowledges, however, that this mode of proceeding will not answer in the "*esquinancie inflammatoire*."



of the precise time in which disease would commence in the lungs. The time that has elapsed between the commencement of the attack and the disease reaching an alarming height, is a point of the utmost importance; and the patient in whom the difficulty of breathing has increased rapidly, must be operated on at once, whilst, perhaps, more time may be allowed for the trial of antiphlogistic measures, if three or four days have already elapsed. The lungs can accommodate themselves to a very diminished supply of air, provided such diminution occurs gradually and slowly, as is daily evidenced in phthisis pulmonalis: but they cannot endure a quick or sudden exclusion of air consistently with the maintenance of life, and therefore the rapidity with which the symptoms of suffocation have progressed must always be regarded with the utmost attention.

But if all these circumstances cannot be ascertained, the safest mode of treating those sudden and severe attacks of difficult respiration will be to regard them as cases of mechanical obstruction, and proceed to the operation without delay. The necessity of an early adoption of bronchotomy may be well illustrated by comparing it with other surgical operations. For instance, it has often happened that an hernia has been fortunately reduced after a patient has been placed upon the table, yet no man now thinks of waiting until he sends round the town for a number of practitioners to try the effect of the taxis: and if he did so, or delayed on any other account, the chance of failure in his operation would be precisely in proportion to the length of time thus thrown away. The cases are nearly similar, except that the one which threatens suffocation is far more urgent, and that therefore the reasoning which is applied to the one, and now universally acted upon, should be allowed to have some weight upon the other. In fact, it should never be on

the results of a few fortunate cases that any point of surgical practice ought to be established, but on a due comparison between those which ended favourably or otherwise, under the same treatment, and on a knowledge of the pathological effects, either produced or likely to be produced during the progress of the disease. If, then, it can be ascertained that bronchotomy adds little or perhaps nothing to the patient's danger, there seems to be no sufficient reason why it should not be practised in the very outset of the disease; and afterwards, when the immediate danger of suffocation is past, the surgeon can take his measures for subduing inflammation calmly and securely, and with the fairest prospects of success.

Having advocated the early performance of bronchotomy in cases of acute laryngeal disease, I cannot avoid offering an opinion, that, if it is not adopted early, it had much better be let alone altogether. It is exceedingly injudicious in any practitioner to undertake an operation merely on chance, or at least without maturely considering as to its probable result; and as principle must be altogether abandoned in such a mode of proceeding, the majority of such cases will be found not to have added to the reputation of either the individual or the profession to which he belongs. But if the case has proceeded to an extent which renders recovery impossible, how much more injudicious is it thus to tamper with the feelings of a patient or his friends; and therefore how necessary is it for a surgeon to be cautious in proposing an operation until he has first satisfied his own mind of the non-existence of any symptom unfavourable to his undertaking.

Within the last few months I have witnessed two very melancholy illustrations of the truth of these remarks, one of which was particularly painful, because the operation was pro-

posed at an early period, and prevented by the interference of the patient's friends. It was performed as a last resource, when too late, and death followed in the course of a few hours. The other was a female in humble life, who may be said to have perished through her husband's obstinacy. It is unquestionably very difficult to ascertain the precise moment after which the case becomes hopeless; for I believe disease commences in the lungs before the lividity of the lip and countenance appears, and therefore an operation may be undertaken with reasonable probability of success, and yet terminate unfortunately. However, such a failure is excusable, and is by no means to be ranked with those attempts which are made at a time when the patient must die whether an operation is performed or not. I have witnessed many operations in cases of acute laryngitis, and as yet have seen but few successful; and I would attribute this, not either to the severity of the affection, or to the inadequacy of the operation to procure relief, but solely to the circumstance of a considerable portion of time being previously employed in trying to subdue it by the usual measures for combatting inflammation, and the use of the knife being thus postponed until a period when it was only tried as a last resource, and could by no means promise even a probable chance of success.

Beside that form of laryngeal inflammation which leads to the effusion of serum within the submucous tissue and the formation of œdema, there are other affections that may be termed acute, if severity of symptom and rapidity of progress warrant the application of the term. In these cases the mucous membrane remains unaltered, and the general structural derangement of the organ either does not exist, or is so trifling as to be insufficient to explain the fatal result. This occurs from diffuse inflammation of the cellular tissue—sometimes external to the mucous



membrane—sometimes around the larynx, trachea, and œsophagus—sometimes at the front of the trachea; and I have recently seen a case in which symptoms of obstructed respiration were produced by the tumefaction occasioned by a gangrenous supuration of one side of the neck, which apparently had commenced at the base of the skull.

The first instance I witnessed of this was in a case of attempted suicide in the person of a young woman: she died apparently suffocated on the sixth day; and, on dissection, there was no appearance within the larynx to account for the dyspnea; but all the cellular tissue around both it and the trachea, and down into the anterior mediastinum, was sloughy and putrid, loaded with offensive purulent matter and flakes of an unorganized whitish lymph. I have since met with several similar cases, in some few of which I have been enabled to form a diagnosis, by observing the character of the accompanying fever—by the feel of the epiglottis, and by a peculiar glassy appearance of the front of the neck: yet it is only justice to observe, that in very many instances there is little or nothing to guide the practitioner; and it is only when dissection has developed the nature of the disease that he is able to explain why his operation has failed. A case of this description is mentioned in the 11th vol. of the *Edinburgh Medical and Surgical Journal*, excepting that, in this latter, there was a laryngeal disease also, but scarcely sufficient to account for the unfortunate result.

Amongst the numerous interesting and instructive cases that have added so largely to our pathological and practical knowledge of this subject, I may particularly notice one, detailed in the 38th No. of the *Medico-Chirurgical Review*, which appears illustrative of the object of the present work, inasmuch as bron-

chotomy was performed, and without success, the patient having sunk and died in the course of nine hours afterwards. In the dissection of this case "coagulable lymph and pus were found effused at different parts into the cellular substance, all along the front of the larynx and trachea to the bottom of the neck, and some lymph into that of the anterior mediastinum. The pus and lymph were in greatest quantity on the left side of the upper part of the trachea.

"The superior chordæ vocales might be a little thickened, but the mucous membrane of the larynx presented no other evidence of disease. There was some redness of the upper part of the trachea, increasing in intensity lower down. The bronchi were still more red, and their surface was covered with threads of puriform mucus. The lungs were loaded with blood."

It also occasionally happens that erysipelatous inflammation attacks the larynx and trachea, and produces symptoms of dyspnoea of a singularly formidable character. In the winter of 1835-36, erysipelas prevailed to a very considerable extent in the Dublin hospitals; and many examples occurred of its seizing on the throat, either by apparently spreading to it from the head and face, or by some species of metastasis, the disease subsiding externally on its engaging the internal structures. Amongst all these cases I have not heard of a single recovery; neither do I suppose such to be possible, considering the low and typhoid character of the accompanying fever. In most of these the sub-mucous cellular tissue was found extensively infiltrated with sloughy and putrid matter. I am not at this moment aware that bronchotomy was performed on any of these patients, although I know it was proposed with reference to three; and if it had been, I cannot by any means imagine it could have been

attended with success. They certainly suffered from fearful difficulty of breathing, and, after death, the rima glottidis was found more or less obstructed; but these circumstances, perhaps, only accelerated an event in other respects inevitable.

In all these cases of diffuse inflammation (and erysipelas bears a strong similitude towards them), operation of any kind seems to be nearly valueless, and death to be almost inevitable. Deep and extensive incisions appear to be the only rational mode of treatment; but in these cases we should not entertain too favourable expectations from them. If the infiltration was limited in extent, or consisted of a serous fluid alone, or if it could be reached, or, being reached, could be evacuated, there would be a reasonable chance of relief for the patient; but the very opposite of these conditions is generally the true one. In diffuse inflammation of the neck I have seen incisions made down evidently into the diseased structure without giving exit to a tea-spoonful of fluid; and, after death, the entire cellular tissue of the part engaged was found of a dark green and sometimes of a brown colour, dead, putrid, and horribly offensive. The difficulty of breathing, however apparently severe, is only a secondary consideration; and even if removed, the patient would perish nevertheless of that low and typhoid fever which always attends these affections.

When a case is thus marked, it is not for a moment to be supposed that any surgeon would contemplate the operation of bronchotomy; it could not succeed, and would not even possess the miserable second-rate merit of being a last resource, or offering a patient a chance of life. But it is not every case that exhibits such decided characters: very generally the disease is insidious, and may have proceeded to a destructive extent inter-



nally, without affording any outward indication of the nature of the mischief within. Such appears to have been the case, the dissection of which has been just quoted; and surely, in the absence of evidence of incurable disease, the surgeon is right who seeks to relieve the prominent and distressing symptom of difficult respiration. He fails certainly; but he does so with the consolation of having performed his duty to the utmost of his ability, and been defeated by a complication that could not have been foreseen. There may, therefore, be some difficulty in cases of diffuse inflammation; but I cannot think there would be any in sporadic erysipelas: the nature of the case there is obvious to the senses—the cause of the difficulty of breathing is fully apparent—the progress of the disease cannot be checked by any operation; and, instead of affording even temporary relief, its tendency must be to accelerate the fatal event.

Unwilling needlessly to swell the bulk of this volume, I have selected from a great number the following cases, as particularly illustrative of the preceding remarks: to one of them I would solicit the reader's attention, as shewing the possibility of resuscitation, even after a patient has been reduced to a state of asphyxia, and the consequences of that bronchitis which I have stated to be the never-failing result of the operation. To these I could, on reference to my notes, add several cases in which the patients were lost, sometimes from the practitioner not being aware of the real nature and urgency of the case, but far more frequently from the obstinacy of the patient's friends in refusing to consent to the only measure that could afford relief. Having, however, already insisted on the necessity of having bronchotomy performed at an early period in this disease or not at all, I do not consider it necessary to dwell upon a point that I regard as sufficiently obvious.

## CASE XIII.

In the month of April, 1816, a gentleman residing about sixteen miles from Dublin was attacked with what he considered to be a sore throat. He was a large man, very strongly made, inclining to corpulency, but of active habits, and moderate in the pleasures of the table. He might have been 47 years of age. He was taken ill in the evening with shivering, and an inclination to crouch over the fire, slight headach, pain in the throat, and a trifling difficulty in deglutition. He had some warm drink and went to bed, but passed the night rather restless and uneasy, and when, towards morning, exhausted with watching, he had fallen asleep, he shortly awoke in a paroxysm of suffocation. Still, when he had roused himself, the difficulty of breathing was not such as to occasion great alarm: he complained of a dryness or huskiness in the throat, and was annoyed by a short cough without expectoration.

In the morning an apothecary who resided in the neighbourhood was summoned; and by the time he arrived the symptoms had advanced so rapidly as to become serious and alarming. The patient was bled, had purgative medicines, and a large blister was applied to the throat, but without the smallest relief.

Happening accidentally to be in the neighbourhood, I was called to see him about four o'clock in the afternoon. His face was then pale and swollen; his eyes glassy and protruded; his breathing loud, harsh, and stridulous; and the efforts he made to carry on this function were frightful. His pulse very rapid, but not full. He perfectly retained his senses, and pointed to the thyroïd cartilage when questioned as to the seat of his dis-

tress. He died in about an hour afterwards, twenty-one hours from the first approach of the disease.

After a good deal of difficulty, I prevailed on the friends of the deceased to allow me to examine the windpipe, and permission was only granted under a promise that no other part should be interfered with. The lining membrane of the larynx appeared slightly inflamed, and of a bright pink colour, but not thickened in structure. The epiglottis did not participate in the disease at all. The submucous tissue was œdematous, so as to approximate the edges of the rima glottidis, and nearly close up the aperture. The larynx contained a good deal of frothy mucus, and its surface was smeared over with a yellowish glutinous substance, not very unlike diluted honey.

#### CASE XIV.

On the 16th February, 1819, I was requested by a woman of the name of Mathews, who resided in an obscure court off Fishamble-street, and who had formerly been under my care as a patient of the Dublin General Dispensary, to examine the body of a boy, to whom she had through charity given a lodging in a waste room, and whom she suspected to have taken poison.

She could give no account of his illness, except that he had been dull and heavy the entire of the preceding day, unable to beg about the streets, as usual, but complained of feeling his throat sore, and in the evening had gone to an apothecary's shop, where he got something in a cup, but what it was she could not tell. He went to rest early on his bed of straw, and was found dead next morning.



I examined the abdomen first, but found every part of the viscera healthy; the stomach was empty, unless a little mucus on its internal surface; but neither here or in any other part of the intestinal canal was there the smallest trace of inflammation, or any indication that he had died by poison. The circumstance of his having had sore throat led me to examine this part. There was very little appearance of inflammation about the fauces; the epiglottis was red, erect, and swollen to twice its usual thickness. The mucous membrane appeared inflamed as far down as the rima; but here, as if a line of separation had been drawn, the progress of the disease seemed to have been abruptly checked. The submucous tissue was quite œdematous, and on looking down into the larynx, it became evident that the tumefaction had absolutely closed up the glottis, and caused suffocation.

The lad appeared to have been about 19 or 20 years of age.

#### CASE XV.

About nine o'clock on the evening of the 7th April, 1833, I was requested by a medical friend to visit a gentleman very far advanced in life (about 70 years of age), who was suffering from a very severe attack of acute cynanche laryngea. He informed me that this gentleman had been long confined with pneumonia, from which he had recovered tolerably well, when, owing to some indiscretion in diet, he was seized with the laryngeal affection. It had commenced in the morning, increased gradually but rapidly during the day, and towards evening had reached such a height as to render the operation the only means by which life could be preserved. On reaching the house in which he

resided, I could, whilst in the hall, distinctly hear the stridulous breathing of the patient, who lay in one of the uppermost rooms; and on seeing him I requested that the nearest assistance should be procured, as it was absolutely necessary to proceed to the operation without the loss of a moment's time. The attendance of Mr. Smyly was obtained; and in the presence of him, of Dr. William Stokes, and another physician, I proceeded to perform tracheotomy.

The patient was merely turned round so as to place his head at the foot of the bed; he was supported by pillows, and his head rested against my knees. On making the first incision, I perceived the body of the patient yield under me—the respiration totally ceased—the eyes became fixed and glazed—and a white froth gathered on his lips: he was to all appearance dead, and every one present experienced that feeling of distress that must attend the death of a patient under such circumstances. There was still, however, a chance remaining; and, encouraged by Dr. Stokes, for whose support and assistance on that occasion I shall always feel indebted, I instantly plunged the knife into the trachea, turned it slightly round to enlarge the aperture, and, having introduced a tube, commenced artificial respiration. During several seconds we remained in equal doubt and alarm, when a single long-drawn inspiration through the wound, with a peculiar stridulous sound, announced the possibility of recovery, and encouraged us to persevere. In twenty-seven minutes he was lying tranquilly asleep, breathing with the utmost facility through the tube.

During the entire of the next day and the succeeding night the patient continued in so favourable a condition as to warrant the fairest expectations of recovery. He was ordered calomel

and opium, which he continued to take on this and the following day, although on this latter he was much weaker; yet still there was no decidedly alarming symptom. But during the night of the second day bronchitis set in, accompanied by sonorous breathing and a hard cough, with great difficulty of expectoration. This rapidly increased, and at the time of the morning visit it was evident our poor patient was dying. He expired in a few hours afterwards, thus frustrating all our exertions, and shewing that the operation, considered *per se*, is not always so free from danger as has by some been so confidently stated.

#### CASE XVI.

On the 16th Sept. 1830, William Kenny, aged 47, was admitted into the Meath Hospital, under the following circumstances:—

On the previous evening he had a severe rigor, which was followed by sore throat: he went to bed, but awoke about the middle of the night with great difficulty of breathing, attended by a stridulous sound, cough, and inability to swallow. On admission, the peculiar sound of the respiration was easily recognizable; the voice was nearly lost; there was cough with slight expectoration, and on an attempt to swallow fluids they were forcibly rejected by the nares; pressure on the larynx was attended with some pain. He was ordered by Dr. Graves to lose thirty ounces of blood from the arm, and to take two grains of tartarized antimony, in solution, every hour, which at first appeared to produce some relief; but in the evening the symptoms became so exasperated as to render an operation necessary, and Mr. Macnamara (whose month of attendance on the



hospital it was) was summoned to take the future charge of the patient.

He found him in a situation that would admit of no delay : his respiration loud, stridulous, and performed with the utmost difficulty; pulse very quick; the extremities cold, and the upper part of the body covered with a clammy sweat. On introducing the finger into the fauces, the epiglottis was felt erect, pulpy, and swollen to the size of a large walnut. He immediately determined on the operation, which was performed in the usual manner, except that it occupied a little longer time by reason of the extraordinary depth of the trachea, and that the incision of this organ was somewhat difficult, in consequence of its rings having become ossified. There was no hæmorrhage of any account; and at the termination of the operation the patient experienced so much relief, that he fell into a deep and refreshing sleep.

It is needless to enter into the minute history of the subsequent progress of this case, which was, in every respect, as favourable as the operator could wish, and afforded the most satisfactory proof of the efficacy of the operation when undertaken at the proper time. This patient had calomel and opium to the extent of affecting his mouth: in a few days he was able to respire partially through the glottis; and at the end of three weeks was so far recovered as to be able to leave the hospital, the wound in his neck being nearly healed.

## CASE XVII.

Anne Nowlan, aged 35, was admitted into the hospital Nov. 1, 1835, for a large firm tumour which occupied the left side of the abdomen, apparently arising from disease of the spleen: there was also some effusion into the peritoneal cavity, with anasarca of the lower extremities, and considerable emaciation of the entire body.

On the morning of the 9th, she began to complain of some soreness of the throat and headach, with chilliness, lassitude, and loss of appetite. In the evening the lids of the left eye became œdematous, shining, and so swollen as completely to prevent the eyeball from being exposed: the swelling extended for some distance down the cheek, and was accompanied by a pale erysipelatous blush, the margin of which was not accurately defined. The soft palate was red and swollen, and deglutition began to be extremely difficult.

She happened to have been placed in a bed next that of a patient that had been labouring under idiopathic erysipelas, but at the time was becoming convalescent.

Habeat. Carbon. ammoniæ, grana tria  
Camphoræ, grana duo  
In forma pilulæ tertiis horis.

10th.—Slept badly. Reported to have raved during the night, and was much worse this morning; difficulty of swallowing increased, every attempt being attended by severe pain in the throat; intense redness of the soft palate, uvula, and back of the pharynx; cough, with slight mucous expectoration; respi-

ration hurried, and somewhat sonorous. Pulse 120, compressible; tongue furred, but moist; thirst insatiate; right eyelids were now swollen, and presented the same appearance as the left; but the erysipelas had not extended down the face.

Reptr. pilulæ

Vini rubri uncias octo in die

Misturæ mucilaginis cum vini ipecacuanhæ unciâ tertiis horis.

6 P.M.—The report was as follows:—Disease has progressed rapidly since morning; is now sitting up in bed, gasping for breath; face pale; forehead and upper part of the body covered with a cold clammy sweat, extremities also cold; inspirations long continued, performed with difficulty, and accompanied by a stridulous but not very loud noise; expirations performed quickly, and with comparative facility; voice a good deal altered, and weak, but she can still be heard at the other side of the ward; cough less frequent, but total inability to expectorate.

The sterno-hyoidei and thyroidei muscles can be observed to be very tense at each act of inspiration; the larynx does not move either upwards or downwards in the neck; compressing the thyroid cartilage back against the spine does not give pain; the finger passed down to the epiglottis detects its anterior surface much swollen, and it has a soft feel. The swelling of the soft palate and uvula remains as before, but the parts are coated over in patches with a whitish matter. From the noise she makes in inspiration, it is impossible to ascertain the state of the lungs by means of the stethoscope. She is afraid to drink, for fear of being choked, and points to the larynx as the seat of the pain when she makes the attempt: expresses great anxiety as to the result of her case, but refuses to take the wine or medicine. Both eyelids are of a yellowish hue, as if matter was effused un-



derneath the cuticle ; but when punctured nothing but blood flowed out.

At 8 o'clock this evening I saw her in consultation, when it was agreed that operation held out no prospect of benefit.

11 P.M.—There was little change in the patient, except a gradual increase of debility. In every act of inspiration she made two or three efforts to fill the chest : expiration was performed suddenly and at once. At this time the lips were beginning to assume a livid hue.

She died at 2 A.M.

*Dissection six hours after death.*—A great deal of congestion about the veins of the neck ; cellular membrane about the muscles of the larynx filled with a serous fluid ; mucous membrane at the back of the pharynx of a pale yellow colour ; some few minute superficial ulcerations, with intervening patches of a bright red. The epiglottis greatly thickened and swollen, its anterior or lingual surface round, and of a yellow colour, occasioned by a deposition of lymph into its submucous tissue ; its posterior surface equally swollen, but of a deep red colour. The aryteno-epiglottidean folds swollen and puffed out : the cavity of the larynx so œdematous as to obliterate the superior chordæ vocales and contract the opening of the glottis to one-third of its usual dimensions.

The mucous membrane lining the trachea and bronchial tubes extremely red and vascular, with some tough mucous in the smaller ones ; lungs otherwise healthy.

## CASE XVIII.

Teresa Williams, aged 19, admitted into Mercer's Hospital on Friday, December 4th, 1835.

Complains of extreme difficulty of breathing, which occurs in frequent paroxysms, and attended with great effort, as if she was unable to fill her chest at each inspiration. Pulse 110, very small; great anxiety of countenance; hands covered with a cold sweat; no appetite; bowels regular; some slight redness of the left cheek.

States that about five days previously she perceived a lump in her throat, with some difficulty of breathing, which has been progressively becoming worse up to the present. Has been exposed to heat and cold, and accustomed to lead an irregular, dissolute life; is seven months pregnant.

R. Pulv. ipecac. gr. xv

Ant. tart. gr. ij

Fiat pulvis statim sumendus.

R. Calomelanos

Pulv. Jacobi veri, āā gr. vi

Fiat pulvis et in chartas iij divide, sumat unam tertiā quâque horâ.

Hirudines sex regioni laryngis applicand.

5th.— Difficulty of breathing increased: puts all the extraordinary muscles of respiration into action, grasping her hip and the sides of the bed alternately; frequent moaning; countenance expressive of great suffering and anxiety; swelling of the face increased. Pulse 120, very small. Can only take

a mouthful of drink at a time (which is partly regurgitated through the nostrils), as it adds considerably to her sufferings. On putting the finger into her fauces, the epiglottis can be felt erect and swollen.

℞. Calomelanos, gr. xij

Ant. tart. granum

Cons. Ros. q. s.

In bolos iv, divid. Sumat unum 3<sup>tia</sup> q. q. horâ

Fomentum tepidum faciei.

5 P.M.—Respiration more difficult; lies on her back, with her chest exposed, tossing her arms about. An extraordinary degree of wildness in the countenance. Swelling of the face increased, with vesications.

Applicentur hirudines xij laryngi et postea foment. tepidum

℞. Sulphatis magnesiæ unciam

Infusi sennæ uncias sex

Tincturæ jalapæ semiunciam M.

Sumat cochlearea duo, tertiis horis ad effectum.

10 P.M.—Bowels not acted on.

Injiciatur enema catharticum statim

℞. Ant. tart. gr. iij

Aquæ puræ uncias vi. ss

Syrupi ss. M.

Sumat cochleare amplum secundis horis

Illinatur axillis unguenti hydrargyri drachma.

6<sup>th</sup>.—Bowels freely moved; says she feels better; did not sleep during the night. Respiration nearly the same as yester-



day, attended with a crowing noise at each inspiration. Pulse 120, small; swelling of face increased: both eyes nearly closed.

R. Calomelanos, gr. iij

Ext. cathart. gr. vj

Ant. tart. grani 4

M.

Fiant pilulæ ij. Mitte x tales. Capiat ij tertiis horis.

Hirudines xij laryngi et continuatur mistura ant. tart.

7 P.M.—Fell asleep before six o'clock, and continued so nearly an hour. Respiration still worse; puts herself into every possible posture in order to facilitate it. Pulse very feeble, and so quick that it can scarcely be counted. Bowels acted on several times during the day; swelling of face somewhat less, but has a livid appearance, particularly about the lips. Is troubled with a short cough, as if endeavouring to expectorate some adhesive mucus: was delirious at times during the day.

*Nine o'clock.*—Respiration slower and stertorous, the efforts to perform it less violent; lividity of the countenance increased; a quantity of slimy discharge issuing from the mouth. Pulse scarcely perceptible.—Expired soon after, in a comatose state, apparently exhausted by her previous efforts.

*Autopsy.*—On removing the larynx and trachea, the epiglottis stands erect, and much swollen: great thickening of the parts surrounding the glottis, leaving but a small irregular opening. The ventricles of the larynx and epiglottidean folds are involved in the general swelling, and not to be distinguished. Some ulceration extending backwards to the beginning of the œsophagus. On looking at the larynx from below, the parts appear so much thickened and ulcerated, that, in all probability, the rima was completely closed.

Brain and thorax apparently healthy.

This last case was treated in Mercer's hospital, and I am indebted for its details to my friend Mr. Palmer.

### CHRONIC CYNANCHE LARYNGEA.

Mild forms of the disease—Symptoms—Treatment—Ulcerations of the Larynx—Treatment—Bronchotomy—End to be obtained by the Operation—Observations.

Under this name may be included all those affections of the larynx which materially interfere with respiration, but which commence so insidiously, and proceed so slowly, as often to produce an incurable disease before the patient's attention is aroused to the perilous nature of his condition. Very generally the result of these chronic affections is a morbid alteration of structure that can never be removed; but it is also to be recollected, that the symptoms will not be sufficient to mark a distinction between diseases of the larynx that are curable, and those which are not. It is true, that if the mucous membrane had been thickened to a certain extent it never recovers its former healthy state; and even if the patient is preserved, he will ever after suffer from hoarseness, or other imperfection of voice: it is also true, that if the mucous membrane is ulcerated, or the cartilages degenerated and in a state of exfoliation, the disease may be considered as totally incurable; but if the affection be only simple abscess seated behind the larynx, or tumour pressing upon this organ, a case of which is related by Morgagni, there can be no reason why surgical interference

should not in these cases prove successful. The only difficulty will be to distinguish one of these affections from the other, and this can alone be accomplished by attention to collateral circumstances, such as the age, disposition, and habit of the patient, his exposure to specific contagion, and by comparing these with what is known of pathological changes occurring in the various structures under these different influences.

The simplest form of laryngeal disease with which I am acquainted, is that which is usually termed hoarseness, and which varies from a rough, raucal tone, to an indistinct articulation, or perhaps to a total loss of voice. Sometimes this is a sequela of common sore throat, and perhaps is occasioned by the spreading of inflammation to the small muscles of the larynx, and occasionally there is considerable pain experienced in every attempt to speak. Very often, however, there is no uneasiness, whatever felt, and as there is no difficulty of respiration, possibly there may not be inflammation or thickening of the mucous membrane, although the occasional occurrence of slight catarrh subsequently would rather militate against this opinion. This affection is usually brought on by exposure to cold, or to the moist evening air, and often seizes the patient so suddenly, that the loss of the power of articulation is the first symptom observed. It is most prevalent in spring and autumn, and some patients seem so disposed to it as to be affected by the most apparently trifling causes. Persons who are unaccustomed to speaking either loud or long are often attacked thus, after being obliged to make an exertion of this description; and I have known a young clergyman nearly unable to articulate for three days after his first essay in the pulpit. Young females, too, who occasionally exert themselves in singing, frequently suffer in this manner; but, generally speaking, the disease, if disease it



can be called, is occasioned by cold or damp, and is therefore probably of an inflammatory nature.

In the common forms of this affection it is seldom necessary to adopt any medical treatment, for it will usually subside spontaneously; but if it be so troublesome or unpleasant as to render it desirable to be gotten rid of, the inhaling the steam of warm water, or of water and vinegar, during a few hours, will scarcely ever fail of the desired effect, particularly if combined with abstinence from animal food, and confinement to the house for a short time.

Occasionally, either from frequent attacks of the affection just spoken of, or from exposure to a more severe exciting cause, an increased action takes place, and a more permanent disease is formed. The membrane becomes thickened, the respiration, of course, more or less impeded, and as the organ can never enjoy repose, there is a strong tendency in the disease to become aggravated. It is extremely common amongst the poorer classes; and I have met with many cases among the extern patients at the Meath Hospital, most of which were washer-women, who attributed their illness to going out of a warm laundry for the purpose of hanging clothes to dry in the open air. In some instances the attack is so severe as to be accompanied by symptomatic fever, shivering, and headach. The voice is always impaired. There is sometimes pain, and when this symptom is present, the uneasiness is always referred to the situation of the thyroïd cartilage. On examination, the fauces are found healthy, and free from marks of inflammation. Cough is sometimes present, but dry, husky, and without expectoration. There are in this, as in every other laryngeal affection, severe spasmodic exacerbations, which are

the source of great inconvenience to the patient, but are, however, seldom dangerous.

When the morbid action has not proceeded to a greater length, I have been in the habit of using mercury to the extent of slightly affecting the mouth, and I cannot recollect a single instance in which it failed of affording relief. After recovery, the patient's voice is generally restored; but if the disease is of long continuance, such an alteration of structure takes place in the mucous membrane of the larynx that the power of articulating clearly is never again recovered.

There is sometimes considerable difficulty in distinguishing between these milder laryngeal affections and inflammations of the bronchial membrane, for in both the voice is impaired, in both there is a harsh and husky cough and difficulty of respiration, and in both the disease seems to give way on the appearance of mucous or purulent expectoration. But bronchitis is usually preceded by febrile symptoms, and during its continuance the circulation is accelerated, which does not happen in laryngitis. There is also a painful sense of oppression in the chest, with difficulty or impossibility of drawing a full inspiration, and perhaps of lying on one particular side. In bronchial inflammation also the countenance is generally swollen and pale, and the lips clear and colourless, and it is very frequently accompanied by palpitation or other irregularity in the action of the heart. When the larynx alone is affected, these symptoms are usually absent, unless in the latter stages when the lungs become engaged, and then the two diseases are found complicated. I have seen hysteria, in one or two instances, produce symptoms bearing a strong resemblance to chronic laryngitis; but this is easily

discovered by paying even a slight attention to the progress of the disease.

It sometimes happens that, from ineffectual or injudicious treatment, the disease under consideration becomes truly formidable, and brings the patient's life into the most imminent peril. At first, as I have mentioned, there is only a loss or depravation of voice, that may or may not be accompanied by sore throat or other inflammatory symptoms. This is succeeded by difficulty of breathing, at first slight and not very troublesome, except during a paroxysm of suffocation. If, however, the patient is observed in this stage of the disease, he will be found to make strong exertions at every inspiration; the trachea and larynx will be drawn up as high as possible in the neck, and the digastric muscles will be seen in strong and constant action. At this period he will be likely to apply for relief, for few persons can quietly submit to any disease that interferes with respiration, and he is bled or probably blistered, or gets some trifling antispasmodic medicines. The disease is not checked, perhaps it is aggravated, and either at once demands speedy and decisive surgical assistance, or proceeds more slowly, but not less certainly, to that period when only such aid can be the means of preserving life. The difficulty of breathing now becomes excessive, the inspirations long and produced by violent muscular exertion, the expirations comparatively easier and shorter. The voice is almost entirely lost, and in every respect the symptoms resemble those of laryngitis œdematosa. The patient is liable to severe spasmodic attacks of dyspnoea, and is nearly incapable of any exertion, the mere act of walking a few steps being sufficient to induce one of those terrific spasms. It is possible he may die in one of those, but such an occurrence is not likely;



for it is astonishing to what an extent any morbid action may proceed, provided its progress is gradual and slow. Neither is there much danger of an incurable affection being produced in the lungs, these organs seeming to accommodate themselves to the diminished supply of air; and I think I have seen persons endure a degree of difficult respiration apparently without much inconvenience, and subsequently recover, who must have perished miserably had the occurrence of the disease been sudden or its progress rapid.

This is the affection to which the name of chronic cynanche laryngea most properly belongs: it is that in which the operation of bronchotomy has been most frequently followed by fortunate results, and it is one in which it will always be successful if not delayed too long. The disease here is caused by a mere thickening of the mucous membrane, without any morbid alteration of structure; but the circumstance of the larynx being in constant use tends to maintain the action that is going forward, and finally, if not relieved, to produce such a thickening of the part as will be incompatible with the maintenance of its functions. It is thus that creating an artificial passage for the air operates in promoting recovery; and there is some reason to believe that after the operation the powers of nature would be sufficient to work out a cure, even without the intervention of medicine, merely because the organ can enjoy repose. It is, however, a very rare occurrence for this affection to proceed to such extremity, unless it is allowed to increase through neglect, or is aggravated by injudicious treatment; and even without the operation mercury will seldom fail in removing or rather in relieving it; for when the membrane has been thickened to a certain extent, the voice is never afterwards perfectly recovered,

and a considerable degree of hoarseness will remain, if not for ever, at least for a great number of years.

I know not what particular circumstance first induced practitioners to try the effects of mercury in laryngeal diseases. Its well known powers of stimulating the action of the absorbent vessels, and the number of cases that owe their origin to a syphilitic taint, may have led to its employment, and will account for a good deal of the success that has attended it. In every case not depending on or connected with disorganization of structure it will probably afford relief, no matter at what period of the disease it is administered, or under what unpromising circumstances. Where the symptoms are not urgent, it may be given, according to the constitution of the patient, in large or small doses, but always with a view to affect the mouth. If the symptoms are severe, I believe diseases of the larynx are not to be trifled with, and I have given calomel in ten-grain doses four times a-day. As soon as the specific effects of the medicine become developed, the disease begins to decline, and it seldom requires more than a week or ten days to render the cure complete.

Another form of chronic laryngitis is that which is the result of ulceration, sometimes affecting the mucous membrane alone, but more frequently involving the deeper structures, and producing a permanent disorganization of the part. These ulcers present a great variety of appearance, as they seem to arise from different causes; nor is it possible to class them according to the symptoms they occasion, for the intensity of the patient's suffering, or his threatened danger, are not always in proportion to the extent of the ulcer. In some instances, the larynx be-

comes the seat of idiopathic ulceration; at least no ostensible cause can be assigned for the particular locality of the disease. Thus, the laryngeal surface of the epiglottis and the internal parts of the organ itself may be studded over with numerous minute aphthous ulcerations—sometimes the edges are marked by a yellow line of superficial excoriation, bordered by a deep blush of inflammation; and in these cases I have always observed, during life, that great pain and difficulty of deglutition accompanied the symptoms of dyspnœa, and often formed the most prominent feature of the case. Occasionally the ulceration is deep and foul, and spreads with an almost phagedenic destructiveness: these sporadic sores, usually commencing above either in the soft palate or the back of the pharynx and spreading downwards, too often involve the destruction of the patient. Occurring, as they constantly do, in bad and cachectic habits, they are little under the influence of medicine; and operation, however it may prolong existence, scarcely holds out a hope of ultimate recovery.

In general, however, ulcerations of the larynx appear to be of a specific nature, and are commonly referred to a venereal taint; yet although they are doubtless sometimes so produced, it is probable they are more usually the results of frequent, protracted, or irregular courses of mercury, more particularly in patients of a strumous habit. They are seldom solitary, but present several spots of ulceration; and in some cases are so extensive, that the whole configuration of the organ is spoiled and lost, the epiglottis being partially or entirely removed, and the chordæ vocales and ventricles carried away. The surface of this extensive ulceration is irregular, warty, and gives the appearance of uneven granulation, and there are chaps and fissures that pass deeply into the substance of the subjacent carti-



lages, portions of which are removed. When the ulcers are more superficial, they very often exhibit the herpetic appearance and the tendency to spread observed in mercurial sores, healing in one situation whilst fresh ones break out in the neighbourhood, and cicatrising with a depressed surface and evident loss of substance. With respect to symptoms, the loss or imperfection of voice will very much depend on the situation of the ulcers: but the difficulty of breathing and general distress are by no means criteria by which the extent of destruction of parts can be estimated, for sometimes there is uncommon suffering where the ulceration is extremely limited. Very frequently these ulcers (particularly if the epiglottis is engaged) produce symptoms of difficult deglutition, exactly resembling those of stricture of the œsophagus: but this is only during the time that the sores are actually open, for, when healed, swallowing is performed with astonishing facility, even although the greater part of the epiglottis may have been carried away.

For the treatment of this affection when very severe, bronchotomy has been proposed, with the view of placing the organ in that state of quiescence which is necessary to the healing of a sore in any situation, and several cases have been published strongly exemplifying the value of this practice. There can be no doubt entertained by practical surgeons of the importance of repose to any part thus painfully affected; and as ulceration of the larynx always interferes with the function of respiration, the disturbance and distress of the organ will increase with the progress of the disease. Hence it frequently happens that cases occur in which the practitioner has no alternative, and in which he must operate, or see his patient perish before him. Yet is there a difficulty in the management of these cases that can scarcely be explained, and much must be left to the discern-

ment and decision of the surgeon. To be really useful the operation should be performed at an early period, before extensive destruction had taken place; and at this stage mercury is so generally efficacious in arresting the progress of the disease for a time, that few persons would have recourse to the ulterior measure, even if the patient was willing to submit.

In the museum of the school of Park Street, is a preparation strongly illustrative of the above observation. It was taken from a poor woman who had been an inmate of the Meath hospital, ten or eleven different times, for venereal ulceration of the larynx, and finally died there quite suddenly, as if from the effects of spasm. It shews where a large portion of the epiglottis had been removed, the ulcer having healed by a puckered cicatrix. From below the left ventricle a longitudinal scar extended a full inch and a half down into the trachea, the contraction of which had diminished the calibre of that part of the tube very sensibly. The right ventricle was totally obliterated, and on different spots about the superior part of the trachea there were several small pale depressed cicatrices, evidently the results of former sores that had been open at the different periods at which she had been in the hospital. The only ulcer that existed at the time of her death was a very small one, with ragged irregular edges, situated midway between the natural position of the right ventricle and the root of the epiglottis.

About five weeks since, I was called to see a gentleman labouring under considerable laryngeal distress, great difficulty of breathing, a constant wearisome cough with puriform expectoration, orthopnoea, and inability to swallow. On taking a sup of any fluid it seemed to be arrested for a few seconds in the œsophagus, and was then violently expelled, principally through

the nares. He said he experienced but little pain. This gentleman had been a dreadful martyr to venereal disease, or perhaps, I should say more correctly to mercury. On looking into his throat, the whole of the soft palate was gone, and the sides and back of the pharynx marked with irregular lines of cicatrization, such as would remain after an extensive burn. On passing my finger down, only a remnant of the epiglottis could be felt, like a small round button; but touching that spot occasioned exquisite pain, and during the entire evening afterwards the cough was incessant, and the attempt to swallow even the smallest portion of fluid quite impracticable. I was sent for to this patient by a medical friend, in order to perform bronchotomy, which I at once declined; and afterwards I was requested to pass a tube into the stomach, in order to have food introduced through it, which I also refused, being satisfied that the moment his mouth came to be affected by mercury the symptoms would begin to subside—an anticipation which the event fully justified. I learned afterwards that he had been the subject of nine courses of mercury, not one of which had been conducted regularly or under confinement—that he had been frequently attacked by these laryngeal symptoms, but never could be persuaded to observe any regimen or persevere in the use of any medicine after obtaining temporary relief—and that his voice had, during the last eleven months, been so much impaired, that its utmost exertion amounted to no more than a weak whisper. In less than a fortnight, my attendance was dispensed with; he was out of doors walking, and considered himself completely recovered: but the event of the case is still to be determined, nor can it be expected to prove very favourable. Under the best circumstances, there is nothing more difficult than to remove completely from the system the effects of that poison which seems to be the result of a combination of mercury and syphilis.



When in the humble walks of life, these unfortunate patients go about from one hospital to another, treated at one with sarsaparilla, at a second with acids, with iodine, or it may be with mercury, obtaining a temporary alleviation of their sufferings at each, and discharged only to return again, or to apply elsewhere with, perhaps, an aggravated form of disease, until at last they perish, the most miserable spectacles of human suffering.

With respect to the operation of tracheotomy, I think some farther evidence would be extremely desirable; for instance, it ought to be performed at an early period: the patient should be kept under treatment, with a view to the total eradication of the poison; and the history of the subsequent progress of the case carefully sought after. The cases published by Mr. Carmichael are extremely satisfactory, as far as they go; but the operation seems to have been performed more to save the individual from perishing by suffocation than merely to afford repose to the organ: in one case, "all the known means had failed;" and in the other, "it was obvious that the only chance of life depended on the operation." Both these patients were discharged from the hospital "perfectly well," and as far as has been ascertained never suffered a relapse. Here then is evidence of the success of bronchotomy, when performed as a last resource, and of the perfect recovery of the patient; but we still want to ascertain the actual condition of the larynx. Doubtless the subjects of these operations were persons of profligate habits; they bore the marks of the ravages of syphilis on various parts of their bodies, and their throats were deeply furrowed by the cicatrices of former sores—there was presumptive evidence of the existence of extensive and destructive ulceration within the larynx: but when I look at the preparations of such larynges, when I see every trace of the natural shape and

form of the organs swept away, in one place deep and excavated ulcers, and in another warty and almost fungoid excrescences, I cannot conceive how such an ulceration could heal, and at the same time the function of the organ be preserved. In other words, such a patient would be obliged to respire through the wound for the remainder of his life.

I have not brought forward these observations for the purpose of objecting to the operation, or the principle on which it has been recommended—a principle the value of which I have often experienced, and which I have advocated on other occasions. My chief object is to shew that the management of these complicated cases is difficult and uncertain—that in some instances, of a very unpromising nature, mercury has procured a temporary alleviation—and it appears that, when it and every thing else has failed, there may still be a hope from operation. It is a hope, however, which in old and protracted cases I would not cherish myself, or encourage very strongly in the patient's friends: but it must be confessed I have formed this opinion from observing the extensive destruction that occurs, and not from actual experience of the operation.

Before the subject of laryngeal ulceration is dismissed, it may be proper to mention that the softer tissues of the organ are sometimes (though perhaps rarely in the adult) the seat of gangrene. The only instance of this I ever met with was in a man aged sixty-five, admitted into the Meath hospital for pneumonia, who died of gangrene of the lung. Seven days before his death he was attacked with symptoms of laryngeal distress, hoarseness, with difficult and laborious breathing, which gradually increased until the voice was nearly lost and the respiration quite stridulous. After death, besides the gangrene of the lung, a gangrenous ulcer was found involving the chordæ vocales at

the left side : its superficial surface was about the size of a shilling, and of a dirty green colour ; it edges quite sloughy, and its centre excavated to a considerable depth : the mucous membrane around highly vascular and covered with a pellicle of lymph.

During life this patient's breath had the peculiar sickening fœtor so characteristic of gangrene of the lung, which shewed that the laryngeal distress was quite a secondary consideration, and at all events precluded all hope of success from any operation.

### PHTHISIS LARYNGEA.

Diseases resembling this—Abscess in the neighbourhood of the Larynx—Treatment—Abscess complicated with disorganization of the cartilages—Treatment—Bronchotomy—Patients have survived for years, breathing through a tube—Complication of Phthisis Laryngea with Affections of the Lung—Cases of chronic Cynanche Laryngea—of Phthisis Laryngea—of Mortification of the laryngeal Cartilages.

Every disease of the respiratory tube producing difficult or imperfect respiration, accompanied by cough, purulent or bloody expectorations, pain in the region of the larynx or trachea, and exhibiting the usual phenomena of hectic fever, such as night-sweats and colliquative diarrhœa, has been considered and described under the name of laryngeal phthisis. This will probably explain why it has been so often spoken of by some as admitting of cure, and by others as uniformly fatal ; for it is evident that these symptoms may be connected with diseases by no means terminating in disorganization of structure, and which therefore have been cured ; and that, on the other hand, they may result from such derangement as must be utterly irremediable. It will be proper therefore, in the first instance, to



review those different circumstances which may give origin to symptoms of laryngeal phthisis, with a view of arranging them in pathological order.

1st. *A thickened state of the mucous membrane of the larynx and trachea, accompanied by chronic inflammation.*—This will cause difficult respiration, with occasional spasmodic exacerbations, low fever, with nocturnal perspirations, cough, profuse muco-purulent expectoration, loss of strength, and wasting of flesh. However, the respiration is not sonorous, nor is there difficulty of swallowing, nor pain felt in pressing in the situation of the larynx; and after death, instead of effusion into the bronchial cells, an hepatized state of the lungs is usually discovered, particularly if the patient is advanced in years.

2d. *Acute Asthma.*—The symptoms of this affection are in some respects resemblant to those already described, but still the diseases may be distinguished by even a superficial examination. The symptoms of hectic fever are scarcely ever observable.

3d. *Abscess in the neighbourhood of the larynx.*—This, in some one of its forms, constitutes the true laryngeal phthisis, and therefore it will be necessary to investigate the different circumstances under which it may occur, the situation it may occupy, and the several symptoms it may give rise to. Abscesses are sometimes formed on the anterior and lateral part of the neck, situated deep under the fascia, and occasionally creating considerable uneasiness and difficulty of breathing by the pressure they cause upon the larynx. These are easily recognized by the hardness and tumefaction of the upper part of the neck, by the pain occasioned by handling or pressing on them, by the inability of opening the mouth wide, and the existence of severe

symptomatic fever. Fluctuation cannot be perceived, but there is œdema: and although there is great difficulty of breathing, it does not resemble that occasioned by obstruction in the larynx; it is not sibilous or whistling. The patient expresses much anxiety, and is often obliged to keep the erect posture, but has not exacerbations. Even when the tumour has not arrived at the suppurative stage, an incision carried deeply through the fascia will always afford relief by giving it room to enlarge without pressing on the larynx. The purulent matter, when evacuated, is generally small in quantity and of extremely fetid odour; but the evacuation is productive of certain relief, unless when the abscess happens to be situated in immediate contact with the laryngeal cartilages, or that it has burst internally, circumstances that shall be observed upon hereafter.

In some instances the distress produced by abscess pressing on the larynx or trachea is almost intolerable, producing excessive difficulty of breathing, occasional sense of strangulation, orthopnœa, with uncommon restlessness and agitation. In all these cases I have been in the habit of making a deep incision down to the trachea; and although it has happened that I have not cut upon the matter in the first instance, yet it always made its appearance on the following day, the abscess never failing to burst into the wound. This result of the incision in the neighbourhood of an abscess seems to depend on the disposition of purulent matter to make its way to the surface by that route which offers least resistance, and the principle may be turned to advantage in every case where matter exists in a hazardous situation, and it is desirable that it should be discharged externally. The first case of this nature on which I operated was one in which an abscess was supposed to exist in the sub-maxillary gland: the incision was made on the side of the neck,

the labial artery laid bare, and pulsating deeply under my finger. From the importance of the parts situated in the neighbourhood of the incision, and the danger of wounding some large vessel, I was unwilling to proceed; but the purpose was sufficiently answered, for the abscess burst into the wound the next day—the patient obtained immediate relief, and very speedily recovered. Since that period I have tried a similar practice in several cases, in some of which I have cut down upon the abscess at once, and in others have left it to open into the wound, and the principle has been acted upon with the most decisive success by Doctor Graves, in cases of abscess of the liver.—The last, and I think the most interesting case of this nature under my care, was one in which there was no external trace of the existence of abscess, except a slight fulness on the left side of the lower part of the neck, apparently immediately over the carotid artery. From some circumstances connected with the case it was deemed inadvisable to operate low down; and by an incision in the median line of the neck I merely laid bare the lower part of the larynx, and about the three superior rings of the trachea. Yet this answered every purpose. On the following day a profuse discharge of matter took place from the wound, which pressure on the lower part of the neck shewed to have come from the seat of the suspected abscess; and the introduction of a curved probe, which passed downwards and backwards to the extent of two inches and a half, made it plain that the matter had been situated deeply between the trachea and œsophagus.

The most usual situation of abscess is behind the broad portion of the cricoid cartilage, where its presence exercises a very decided influence in pressing upon and obstructing the rima glottidis. The approach of the suffocating symptoms is very



gradual, and their progress slow; and it is extremely difficult either to ascertain its existence, or to apply a remedy. At first there is difficulty and pain in swallowing, with a sensation as if the part over which the morsel passed was abraded. On examining the fauces there is no appearance of inflammation to account for this soreness of the throat, and the patient refers the pain to the situation of the larynx. On pressing this part backwards against the spine it imparts a sensation of fulness and elasticity; and if seized by the fingers and moved laterally across the neck, it does not give a hard feel, as if two firm substances were rubbed together. I cannot say whether symptomatic fever precedes the formation of abscess here; but certainly when it bursts, which it usually does immediately behind the rima, it occasions symptoms exactly resembling pulmonary hectic. When the abscess has given way, purulent matter begins to be expectorated, and the patient experiences some remission of the symptoms of difficult respiration, circumstances which bear some resemblance to the phenomena of bronchial inflammation, and may therefore give rise to some obscurity. But besides that inflammation of the mucous membrane never occasions such severe distress in respiration as abscess, I think the latter may be distinguished by the comparative ease with which expectoration is effected, and the shortness and looseness of the cough. It seems as if the matter was thrown on the rima and expelled by a single effort, whilst in chronic inflammation there are paroxysms of cough, and it is often with great difficulty, and only after considerable efforts, that the tracheal secretion can be discharged. The expectoration from abscess is often largely mixed with mucus: sometimes it is streaked with blood; and sometimes it contains red or dark-coloured flocculi, as if there had been flesh wasted down and dissolved in it. After some time the sputa is altogether purulent, for the lining membrane of the

larynx becomes diseased, and is either ulcerated or altered in structure, assuming a thickened corrugated or granulated appearance, and having its surface partially covered with patches of unorganized lymph.

This is a disease not necessarily involving the operation of bronchotomy; for if the abscess is not accompanied by any organic derangement, an evacuation of the matter contained within it ought to be sufficient to produce a cure: this, however, is a subject attended with the greatest difficulty; for, in the first instance, how is it to be exactly ascertained that an abscess exists there? or supposing this question clearly determined, how can it be known whether it is not complicated with disease of the cartilages, in which case it must be irremediable? And secondly, supposing these points arranged, how is an abscess thus situated to be come at? If a blunt instrument be passed down the throat, with a view of tearing up or rupturing the abscess, it will probably not succeed. If bronchotomy has been performed, it may be possible to pass an instrument upwards through the wound, and thus effect an opening to communicate with the larynx alone; and if it be a case of simple abscess, this mode of proceeding will be likely to prove successful; for as the wound will not be exposed to so much irritation, it may probably heal kindly. However, being satisfied that an abscess was compressing the larynx, I would prefer cutting on it from without; and the operation is not only feasible, but easy, by making an incision down on the thyroïd cartilage, and taking it for a guide, proceeding backwards until the abscess can be felt and opened. It may be objected, that there is considerable risk of hæmorrhage from this operation; and unquestionably there might be such in the hands of a rash or ignorant surgeon, but there is none if it be performed by a man who is well in-

formed as to the anatomy of the part, and no other should ever take up a knife to operate on the neck.

The cartilages of the larynx are also liable to two forms of disease. One of these, which presents symptoms very analogous to pulmonary hectic, I have named the *Phthisis Laryngea*; it occurs from a degeneration of these substances into an earthy, gritty, calcareous matter, mixed up with portions of denuded and carious bone, giving rise to the formation of abscess, which bursts and affords a plentiful purulent expectoration. The other exhibits a specimen of the true mortification of the cartilage as the result of inflammation. In it these structures are found dead, black, and dissolved, resembling wetted and rotten leather. An abscess usually accompanies this, which either bursts into the œsophagus, and thus establishes a communication between the two passages, or externally; and then the air, having access through the ulcer, dries up the cartilage, which lies at the bottom of the sore of a brown colour, and corrugated or gathered up like horn that had been exposed to the action of fire. Occasionally the abscess opens in both these situations, and then the food, but particularly the drinks passing through the ulcer, afford some little insight as to the nature of the case. It should also be noticed that the rotten cartilage has a peculiarly offensive smell, differing from that of carious bone, but not the less disagreeable; and when a surgeon has become acquainted with this symptom, it affords another important help in discriminating this form of disease from others. However, unless to assist in the accuracy of prognosis, it cannot be of much importance to distinguish these affections of the cartilage; for they are both accompanied by considerable alteration of structure in the lining membrane, so as to occasion excessive difficulty of breathing, and, as far as I know, one is frequently and the other uniformly fatal.



4th.—*Abscess complicated with disorganization of one or more of the laryngeal cartilages.*—About the age of 32\*, and varying from that to 36, we occasionally find that the cartilages of the larynx undergo a remarkable change, and are converted into bone. Previously to and during this process, the structure of these substances is highly organized, and a section of them appears red and very vascular. In most instances the change takes place, like every other operation of the animal economy, without inconvenience; whilst in some particular constitution† a morbid action is set up which terminates in this dangerous disease. It commences usually in the broad posterior portion of the cricoid cartilage, this part being now highly organized, and more capable of producing disease. At first a small earthy deposition is laid down in some part of the cartilage, probably near its centre;—it feels hard and gritty under the knife;—is white as to colour,—and perhaps may be somewhat of the same nature as the earthy degeneration in the coats of arteries‡. This increases in quantity,

\* I am aware that some instances are to be found, apparently in contradiction of the idea of this disease occurring at one particular period of life, but on examination I believe it will be ascertained that most cases of true phthisis laryngea have appeared just about the age abovementioned. I think also that persons about that age are particularly liable to spasmodic dyspnoea and other teasing affections of the larynx.

† In two cases that occurred within my own observation, I was enabled to ascertain that the patients had been strongly addicted to whiskey-drinking. I have, however, met with it in females, who could not have been suspected of this habit.

‡ When the contents of an abscess here are examined after death, pieces of carious bone are always found, as if the part had been proceeding in its healthy actions, but was unable to complete them. These shells of bone, which resemble exfoliations, are white, unorganized, and abominably fetid, and lie irregularly mixed with the gritty substance already described.

so that the entire of the cartilage seems to be converted into it; and as it is totally unorganized, it acts as an extraneous body. An abscess is formed which bursts in one or more places; purulent matter is discharged, frequently mixed with this earthy substance already mentioned; the patient becomes emaciated, and worn down with the cough, difficulty of breathing, and other symptoms that attend this melancholy disease: he either dies with most of the appearances of hectic fever, or, if he recovers, it must be after bronchotomy has been performed, and he breathes artificially for ever after.

Long, however, before the formation of abscess, and whilst the morbid change seems to be only commencing in the cartilage, the mucous membrane begins to suffer, and a speck of ulceration or of corrugation appears upon its surface. This produces great irritation, and is probably the cause of the frequent spasmodic attacks of suffocation that a patient suffers. After this, the disease in the mucous membrane seems to keep pace with that in the cartilage; it becomes thickened and corrugated in some parts, whilst perhaps it is ulcerated in others; and when a larynx is examined that has long been the seat of this affection, very little trace of its former configuration can be discovered.

The lungs are not always affected in consequence of this difficult respiration. In one instance I could not discover any marks of disease; in others I have seen such an effusion into the bronchial cells, that the trachea has been filled up with it.

This earthy degeneration of the laryngeal cartilages is an extremely insidious disease, its approach being so gradual as scarcely to alarm the patient, and its progress slow. There is usually sore throat and difficulty of swallowing, although this

latter is not necessarily a constant symptom;—hoarseness—and, at first, but triflingly impeded respiration. These inconveniences in the commencement are not such as to produce much distress; for I have known one patient suffer for three months, and another nearly nine, before either applied for relief, and in both the disease had a fatal termination. Afterwards, however, the symptoms become much more aggravated, the difficulty of breathing is exceedingly distressing, and there are exacerbations that bring the patient to the point of death by suffocation. Indeed, I have known one case in which dissolution took place at a very early period, and when the occurrence could only be explained by the severity of the spasm. At length, as the dyspnœa becomes extreme, the patient suddenly experiences some partial relief;—his cough, which before was teasing and troublesome, now becomes softer, and the expectoration free and copious. This latter has all the characters of purulent matter, and there are mixed with it particles of that dry, gritty, earthy substance already described. Occasionally, pieces of the size of a pea of this unorganized substance are coughed up, and when they appear they leave very little doubt of the nature of the complaint. Towards the latter end of the disease the breathing becomes loud and sonorous, with a whistling noise, so as to be heard at a considerable distance. The cough is incessant; the expectoration copious, with a peculiarly fœtid, gangrenous smell; the patient's breath has this odour also, which may also be regarded as an unfavourable symptom. There is at all times convulsive struggling for breath, with occasional exacerbation. In most cases, but not in all, the chest becomes affected; there is pain in some one part of it or other, with a sensation of tightness round the thorax, as if the patient could not draw a full inspiration. His strength seems to give way rapidly under these symptoms; his body becomes emaciated; he has night-sweats, accompanied with exces-



sive restlessness; and at last he sinks exhausted in the struggle, and dies.

Throughout the entire progress of the disease there is seldom any well marked paroxysm of fever, although the pulse is never much under 100; however, this may be attributed to the constant irritation under which the patient labours. The tongue is usually clean; the appetite good,—in some instances ravenous; and the general functions of the body, with the exception of respiration, seem to suffer but little. The countenance is always pale, with that sickly, dirty hue that characterizes hectic fever. The expression evinces great anxiety; and this is so remarkable, that patients suffering under this species of cynanche often seem to bear a strong resemblance to each other.

It is evident from the nature of this disease, and the morbid alterations of structure it occasions, that a restoration of the larynx to its healthy functions is perfectly impossible. In controlling the local progress of the ulceration, medicine seems to be wholly inoperative; and mercury, so efficacious in relieving other laryngeal affections, has a decided tendency to aggravate this. Perhaps antispasmodic medicines may sometimes be advantageously employed, with a view to diminish the violence of the paroxysms of suffocation that are so very distressing; but even in this attempt the practitioner will often experience disappointment. At length the disease approaches its termination, and the patient is about to perish: still there is a hope for him in the operation; and if his lungs are not diseased, he may survive for many years, but always breathing through a tube, which, after all, does not appear to occasion so much inconvenience as might in the first instance be imagined. In the former edition of this work, I had stated that, in such a case, the surgeon, “certain of the nature

of the morbid action present, need scarcely make an attempt to save him;" and the opinion was founded on my own experience up to that period. I have, however, since had abundant reason to adopt different views, and can fearlessly assert now, that there is no case in which the resources of operative surgery may be made available in a more satisfactory manner. In all cases there is great and immediate relief from suffering, with a prolongation of life for several days, and perhaps for weeks: such had been the uniform results of all my former operations; but I have since had the gratification of saving several persons, although with the alternative of breathing through a tube afterwards. There are at present in Dublin four persons on whom I operated so circumstanced, artificially respiring, without any prospect of being otherwise able to exist for the remainder of their lives. One of these works at the laborious occupation of a stone-cutter, and another is a kind of errand-boy, who subsists by going of messages, and must undergo a considerable deal of fatigue every day. I have, therefore, in now proposing the operation to any patient, very little apprehension of the result, unless there happens to be present some unhappy complication of disease, the most frequent of which is tubercular abscess of the lung.

The first time my attention was directed to this combination of disease was in the month of September, 1828, when I operated on a poor man of the name of Mahony for this affection. The case progressed exactly in the usual way until the 7th day, when I was induced to pass a bougie from the wound upwards into the larynx, with a view of ascertaining the permeability of the rima. In attempting this, I ruptured an abscess, and gave exit to about a tablespoon-full of matter, which escaped by the wound. After this, the patient experienced so much relief, that I began to entertain some expectations of an ultimate recovery; but the cough

continued, with a profuse expectoration, sometimes stained with blood, and at the end of five weeks he died, exhausted and worn out. After death, the cavity of a large abscess was found occupying the situation of the broad part of the cricoïd cartilage; the trachea was covered with spots of broad superficial ulceration, which were continued into the left bronchus; and a large tubercular cavity existed in the upper portion of the left lung. I have since had opportunities of seeing several instances of a similar complication, and it has so frequently been observed by others, that no doubt now can be entertained of the fact.

In some cases of pulmonary disease the larynx seems to be affected sympathetically—at least no structural alteration can be discovered in the organ: such is the aphonia that occurs in the early stages of phthisis pulmonalis, and which frequently continues throughout, only varying in different degrees of intensity. In others, there is superficial ulceration of the mucous membrane, not only of the larynx, but of the trachea and of the bronchial tubes leading to the cavity within the lung. In both these cases there are spasmodic exacerbations of dyspnœa, extremely distressing to the patient, but never so formidable as to induce a surgeon to think of an operation. But the combination more particularly here alluded to is, where a tubercular cavity exists in the lung at the same time that there is caries with exfoliation of some part of the laryngeal cartilages. Previous to operation this complication is not easily discovered, for the reason already so often referred to; namely, that the sound of the stridulous respiration overpowers every other, and renders the results of stethoscopic examination uncertain and inconclusive. Afterwards, the nature of the disease may be more easily detected; but then the discovery comes too late, at least so far as the operation is concerned.



I know not how far the laryngeal obstruction and consequent difficulty of breathing may conduce to the development of a tubercular cavity in a lung favourably disposed; still less can I regard phthisis laryngea as resulting from the previous existence of disease within the chest: perhaps it would be difficult in any case to place the two affections in the relation of cause and effect; but that they exist together is a fact that I have verified by dissection, and the effects of which I have painfully experienced in the unfortunate termination of operations that would otherwise almost certainly have proved successful. I have at this moment under my care a case that I fear will illustrate these remarks. Mrs. H.—, æt. 26, married, and the mother of six children, was attacked with symptoms of laryngeal dyspnœa nearly twelve months since: she attributed her illness to cold taken by exposure to an open window whilst in perspiration. Since that period she had applied to several different practitioners, without experiencing any decided benefit, although at times she imagined there was some slight improvement: she tried a variety of local applications and internal remedies without effect, and at length was recommended by her last attendant to seek the benefit of country air. On the 24th May I had first an opportunity of seeing her. She was a small woman, pale, weakly, and emaciated, and, moreover, five months gone in a state of pregnancy; her respiration was slow, laborious, and not only stridulous, but extremely painful; her voice was nearly altogether lost; deglutition almost impossible, from the suffering it occasioned; and pressure all round the upper part of the throat produced great pain. On introducing my finger into the fauces to examine the epiglottis, it was withdrawn marked with blood. On the 30th the symptoms of difficult respiration had increased to such a height, that I was obliged to perform the operation. It is unnecessary to pursue the details of the case minutely. So far

as the operation alone is concerned, it was completely successful: the pain in the region of the larynx has disappeared, and she swallows without difficulty; she breathes with the utmost facility through the tube, but the cough remains, with profuse puriform expectoration, and she has extensive colliquative perspiration, which is wasting her most rapidly. A large cavity is in the upper part of the left lung, the existence of which was not discovered until a fortnight after the operation was performed.

*5th.—Abscess with mortification of the laryngeal cartilages.—*

I have met with but two instances of this form of disease, one of which appeared in an exceedingly acute form, and ran its course through with great rapidity: it distinctly exhibited the characters of abscess in the front of the neck from the very beginning, and the difficulty of breathing caused by it was never very severe. The other was of a chronic nature, afforded symptoms of internal laryngeal derangement, and never gave occasion to us to imagine what the precise form of the disease might be until after bronchotomy had been performed. This last case is peculiarly interesting, in so far as it shews that life may be prolonged for some time by the operation, even in a case so utterly hopeless, and therefore that, in the worst of circumstances, it should never be considered as adding to the patient's danger.

The cartilages of the larynx, in their healthy state, do not seem materially to differ in structure from those situated in any other part, but they are nevertheless apparently less dense, and become spongy by maceration. I have not been able to trace any distinct bloodvessels through their substance, but certainly have seen them very red and vascular about the age already mentioned; and it is worthy of remark, that both the cases which presented themselves to my observation were in patients between the ages

of thirty and thirty-two inclusive. It is very possible, therefore, that sloughing of the cartilages may be occasioned by over-action within the structure itself, whilst the powers of the part are insufficient to bear up against it, or else it may be the result of tumour or other irritation directly affecting the larynx and destroying its vitality.

This is a form of disease which I have not seen described by any author, and the limited experience afforded by two cases only will not enable me to speak of it without hesitation. However, the knowledge that such alteration does occur in the cartilages of the larynx, may be useful in establishing the propriety of making an early opening into abscesses situated in the neighbourhood of that organ, and thus diminishing the chance of the matter becoming deep, and producing a formidable if not a fatal disease. I cannot determine either whether this affection must of necessity end in the destruction of the patient, but should rather suppose it must, for I am not aware of any well-authenticated instance of the regeneration of cartilage; and therefore, as the larynx must be permanently destroyed, existence could only be maintained by establishing an artificial passage for the air during the remainder of life. And even this resource is less likely to succeed here than under any other form of laryngeal disease; for it is accompanied with so much fever, irritation, and general constitutional derangement, as will be sufficient to produce death independent of the disturbance it causes in the function of respiration.

It is needless to enter into an enumeration of the symptoms which characterize this affection, as they may be known by reflecting on the pathological alterations that have occurred. If the abscess is prominent, the symptoms of obstructed breathing



will be less developed: but then the nature of the affection is cognizable to our senses; and if the matter is more deeply seated, the features of the disease so exactly resemble other forms of chronic laryngitis, that no distinction can be drawn between them.

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Having thus examined into some of the pathological varieties exhibited in the different forms of laryngeal disease, it remains to consider what are those cases to the relief or cure of which an operation may be applicable, together with the symptoms that may serve to distinguish them from others in which it might be likely to prove inefficacious or injurious.

In the acute cynanche laryngea I have endeavoured to shew that the disease arises from various causes, and proceeds with different degrees of rapidity;—in some, that it accomplishes the destruction of the patient almost in a few hours—whilst in others its progress is more slow, and more capable of being arrested. The history of the affection proves that in numerous instances it has been relieved by rigorous and decided antiphlogistic measures, and the treatment would be greatly simplified if we could in every instance distinguish the cases that might be so managed with safety. If the complaint has been brought on by cold, and is confined to the mucous membrane alone, there is almost a certainty that bleeding and other similar measures will prove successful; but the point will be to discriminate these from cases in which the submucous tissue is engaged, where such treatment would not only be inefficacious but decidedly injurious. The surgeon has, therefore, to look minutely into every feature of the case, and to watch its progress most anxiously; and if he has tried his resolute plan without immediate and obvious effect, at once to propose

the operation. In the one case it will scarcely add much to the patient's danger, whilst, in the other, it offers the only means by which his existence can be preserved. In this form of the disease, then, there is very little of doubt, and no difficulty ; it is that in which bronchotomy is most imperatively called for, and its success will be in proportion to the stage of the disorder in which it shall have been adopted. It can only fail from having been postponed until the lungs have suffered congestion, and the functions of the brain have been impaired in consequence of this viscus being supplied by a quality of blood not suited to their maintenance.

When it occurs, however, as the sequela of continued fever, as is not infrequently the case, it seldom runs its course with such destructive rapidity, and therefore gives more time for deliberation ; but in many instances it has a tendency to degenerate into ulceration, which even the operation cannot prevent ; and then, if the patient recovers, it is probable he must breathe artificially for ever afterwards. And in the treatment of these cases it must be recollected, that, besides the hazard that attends bloodletting in all forms of laryngeal disease, patients after recovery from fever will not bear this evacuation, and, if it is adopted, that it increases the tendency to chronic disease which is now so much to be dreaded. It has so happened, that within the last few months I have met with several of these cases : many of them have recovered by the exhibition of mercury so rapidly as to affect the mouth in about forty-eight hours ; in a few, this treatment was ineffectual, and the operation was resorted to, which was fortunate in every individual but one : the subject of it is alive, and probably will live ; but there is no likelihood that he can ever have the natural passage through the larynx restored.

In cases that arise from diffuse inflammation, or occur in connexion with or after erysipelas, there can scarcely be a hope entertained from any system of treatment whatever. In the latter instance, perhaps, an operation might prolong a miserable existence for a few hours; but the disease being constitutional, little more can be rationally expected from it. Diffuse inflammation, particularly in parts so deeply placed and of such importance to life, must be inevitably mortal.

But the chronic forms of laryngeal disease present examples of such variety of morbid action, that it will be impossible to lay down any one principle applicable to all; and, moreover, the symptoms that attend these diseases must, from the nature of the functions of the organ, so closely resemble each other, that no surgeon, however great his experience, can confidently pronounce a diagnosis in every case. Fortunately the progress of these affections is slow, and affords not only time for careful investigation, but, even when the symptoms appear to be urgent, the danger is never so great as when the attack has been sudden and its progress rapid. Hence there is usually an opportunity for a trial of the different medicines indicated in the case, and the operation is seldom performed until its necessity has become obviously imperative. Still, its results have been very various. The form of disease in which it has been most frequently and most fortunately employed is the chronic thickening of the mucous membrane; and this would, in most instances, admit of relief by the internal use of mercury, if that medicine was employed at an early period. It has occurred to myself to perform the operation in a case of this description, and the patient subsequently recovered by the administration of calomel to the extent of affecting his mouth; and it appeared to me, that had the medicine been tried at an earlier period, the disease would



never have proceeded to extremity. Yet, on the other hand, there are cases of the thickening of the membrane and cellular tissue which I can scarcely conceive to be removable by any mode of treatment, and in which the larynx could never be expected to resume its healthy functions, whether the operation is performed or not. There are specimens in the museum of the Park Street school exhibiting these structures not only hypertrophied, but dense, solid, and almost of the consistence of cartilage.

It is rare that chronic disease of the larynx endures long without inducing the presence of ulceration in some one form or another; but this is a case, as I have already shewn, that also frequently admits of relief by the aid of medicine alone. It is likewise true that medical treatment often fails, and that the disease will proceed uninfluenced by it, until an operation becomes unavoidable: it is also perfectly true, that the state of disturbance and excitement in which the organ is kept by the patient being obliged to breathe through an aperture of diminished size and irritable surface, seems sufficient not only to maintain but to increase the morbid action: perhaps it may also be assumed, that, when ulceration has reached a certain extent and depth, the restoration of the rima to its pristine shape and integrity is altogether impossible; and thus we arrive at the principle, that, where the surgeon has good and sufficient reason to believe the operation will ultimately become necessary, it should be his duty to perform it at a very early period, in order, if possible, to arrest the further progress of disorganization. There are, however, few cases of greater difficulty. Experience has shewn, that in numerous examples medicine has been efficacious in affording relief and avoiding the necessity of any ulterior measure; whilst, again, but too frequently the operation must be resorted to, and that on a patient harassed and weakened by pro-

tracted suffering, and perhaps also by the agency of the medicine that has been administered. The practice I would insist on, then, is—that however every patient ought to receive the chance of that relief which medical treatment can sometimes afford, yet he should be narrowly and carefully watched, and, when it obviously had failed, the operation should be adopted at once. It will be most valuable in affording repose to the diseased organ; it will remove the danger of the lung becoming congested and engorged; and it will free the patient from those terrible paroxysms of spasmodic suffocation which constitute his most distressing symptoms, and are even frightful to the bystander to behold.

In cases of abscess complicated with caries and exfoliation of the cartilages—that disease which I consider as being the true phthisis laryngea—Bronchotomy holds out the only hope of relief that can be offered to the patient, but with the alternative of breathing through a tube for ever afterwards. This will be easily understood by the pathologist who regards the extensive destruction that has taken place, and the impossibility of the natural conformation ever being again restored. The aperture in the neck allows the patient to exist while the abscess passes through its various stages of bursting and the expulsion of its contents, contracting and healing afterwards: but the rima remains more or less closed; and though a person may, by stopping the tube for a few moments, contrive to articulate so as to be understood, yet is he never able to dispense with the instrument, or entrust respiration to the remains of the glottis alone. Patients thus circumstanced exist far more comfortably than might be imagined: wearing the shirt-collar open, and a handkerchief tied loosely round the neck, they follow their usual occupations without exciting much attention. At first the tube is troublesome,

because the wound has a tendency to contract and close, and its removal for the purpose of cleanliness and its re-insertion are painful and sometimes difficult; but they soon acquire sufficient dexterity to perform these little services for themselves, and after two or three years the duty is easy, for the aperture becomes fistulous. There is, however, one point to which the patient's attention should be directed when the management of the case is given up solely to himself; namely, that the tube is liable to corrode and wear, probably by some chemical action of the mucus upon it. In one of my cases, the instrument having been used for three years, became so corroded, that it broke across in the middle; a portion of it dropped into the windpipe, and another operation became necessary for its extraction.

It may now be observed, that all these cases of chronic laryngitis bear so strong a resemblance to each other, that it is difficult to form an accurate diagnosis; and I may add, that instances occasionally happen in which the symptoms are so severe and so urgent, as to render the operation absolutely necessary, without the surgeon being able, even after the recovery of the patient, to form a conjecture as to what might have been the pathological nature of the case. I have seen three operations performed for the removal of foreign bodies supposed to have entered the trachea, not one of which was found, and the patients recovered extremely well. I have myself operated on a person attacked with laryngitis after fever, which I supposed to be of the acute form; yet the patient never regained the power of breathing through the rima, thereby proving the existence of ulceration or some other structural derangement. And, on the other hand, I have frequently operated without other hope than enabling the patient to live, afterwards breathing through a tube, and been agreeably surprised by finding the larynx gradually reco-



vering its functions, and the parts ultimately restored to their former state of health.

There are, however, circumstances that may assist in approaching a correct diagnosis in some cases, and which are therefore worthy of attentive observation in all; and I consider the following symptoms as evidence of abscess or ulceration in the larynx or its immediate neighbourhood; viz. a soreness, felt when the thyroïd cartilage is pressed upon, and great pain when the part is rubbed laterally across the spine—a sensation as if an ulcer existed low down in the throat—an abominable putrid foetor from the breath, different from and even more offensive than the mercurial odour—together with great pain and difficulty of swallowing. These symptoms indifferently appertain to superficial ulceration or to phthisis laryngea; but we are further enabled to distinguish the latter by the occurrence of cough, with copious expectoration of a fluid, yellow, puriform, or streaked with blood, that sinks in a diffused cloud when thrown into a basin of water; and still more by the expectoration of any particles of that degenerated calcareous substance into which the cartilages are converted. When a patient suffering considerable laryngeal distress has been placed fairly under the influence of mercury without any amelioration of symptom, it is likely to prove a case of phthisis laryngea, that will eventually demand the operation, and be followed by its usual results.

Let it now be supposed that, in a case of uncertainty, the operation has been performed: we shall know that it will be successful by the gradual subsidence of the laryngeal symptoms, and the recovery of the patient's voice and power of breathing by the natural passage when the artificial opening is closed by

the finger. This is, perhaps, the only test that can be relied on; for the anxious expression of the countenance will subside when the difficulty of respiration is removed, and the patient will often express amazing confidence in his recovery. I have known one to smoke his pipe regularly and comfortably a few days after the performance of the operation—a circumstance that proved a partial passage of the air through the rima glottidis; yet the disease never shewed symptoms of amendment, and in a very short time he died. Again, we suspect that the operation will only be partially successful, and the patient be ever after obliged to wear the tube, if after an interval of three or four weeks, on closing the wound, he is still unable to carry on respiration through the glottis, or to speak distinctly. I have seen a person able to perform expiration with facility and without noise, and even to speak in a moderately loud tone, who could not inspire without great difficulty, or exist with the wound closed for even a few minutes. Lastly, when along with the above symptoms we find the cough continue, with profuse purulent expectoration, if there is pain or tightness in the chest, with a difficulty or impossibility of lying on one side, loss of flesh and strength, with wasting perspirations, there is then almost a certainty that the lungs are implicated, and recovery impossible. I do not, however, mean to assert, that the lungs are the seat of disease in every fatal case; because I can well conceive, that in bad and broken constitutions the abscess and ulceration in the throat might never heal, and the irritation consequent thereon destroy the patient: but only that in the great majority of instances such complication exists—a complication the more unfortunate, as it cannot be ascertained previous to operation, nor even always by physical signs afterwards. I have already frequently alluded to the inadequacy of the stethoscope as a means of diagnosis whilst the laryngeal distress

and stridulous breathing are present: after the operation, it is sometimes available; but more frequently it is uncertain. In some cases, I have known a total absence of the respiratory murmur—no sound whatever heard within the chest; in others, the respiration has been loud and rushing—so violent as to preclude the possibility of establishing any diagnosis; and in but a few was the breathing so regular and tranquil as to permit of a satisfactory examination. Where it is desirable to try auscultation, the tube should be withdrawn an hour previously, and cleaned, the presence of the smallest quantity of mucus in it producing a rattling sound that is heard over every portion of the chest.

## CASE XIX.

### THICKENING OF THE MUCOUS MEMBRANE.

Mary Mack, a washerwoman, æt. 37, married, and the mother of six healthy children, applied as an extern patient at the Meath hospital on the 5th March, 1823. She had for some time been exposed to much hardship, being obliged to work throughout the day and a great portion of the night, and was exposed to cold and vicissitudes of temperature. She had been frequently subject to common sore throat, which had usually subsided in the course of a few days; and it was only on account of this attack having been more obstinate, and continued twelve days, that she applied for assistance. She now complained of slight difficulty of deglutition, with extreme soreness if pressure was made on the front of the neck, in the situation of the thyroïd cartilage. There was very little obstruction to respiration, and the cough was short, frequent, and without expectoration; but she did not complain of it as being troublesome.



Her voice was nearly altogether lost, and her utmost efforts at speech produced no more than a whistling indistinct whisper. On examination, not the smallest trace of inflammation could be discovered in the fauces. Her pulse was slightly accelerated, her tongue clean, her appetite good, and her general health not at all impaired; but she seemed frightened at the loss of her voice, and anxious as to the result of her illness.

By the use of calomel and opium, in small doses, this woman was effectually relieved in the course of six days, without having her mouth so far affected as to produce pain or inconvenience; and though having frequently had opportunities since of seeing her, I have not heard of her suffering from this affection at any time subsequently.

## CASE XX.

Anne M'Evoy, a room-keeper on the Coombe, æt. 35, applied as an extern patient at the Meath hospital on the 3d May, 1823.

About a fortnight previously she was seized with shivering, headach, and other febrile symptoms; her throat shortly afterwards became sore, but she did not attend to it, supposing it would subside spontaneously. She had almost entirely lost her voice, and complained of terrible sore throat, and nearly an impossibility of swallowing. There was great tenderness to the touch in the situation of the thyroïd cartilage. She had very considerable difficulty of breathing, and at night was obliged to maintain the erect posture. Pulse very small and quick—tongue slightly loaded.

On examination of the fauces, there was no appearance of inflammation.

This woman was bled immediately to the amount of twenty ounces, and had some purgative medicines with a view to allay the febrile symptoms. She then took calomel and opium in small doses, and in proportion as her mouth became mercurially affected, the disease in the larynx seemed to subside. Her voice had resumed its natural tone on the seventh day, and she was completely cured in the space of a fortnight.

#### CASE XXI.

Miss M. I. L. on the evening of the 15th June 1821, had been practising at music and singing for more than an hour and a half, when she went out to walk with some friends. She remained out some time, until she began to feel chilly and uncomfortable in the air; she returned home so quickly as to occasion some fatigue and slight perspiration, and on her arrival was surprised to find herself so hoarse as scarcely to be able to speak to be understood. She became worse as the evening advanced, but still experienced no inconvenience, excepting the loss of voice.

On the next day the hoarseness was somewhat relieved, but she complained of a slight sore throat, with some difficulty of swallowing: she took some family medicine with advantage, and remained within doors the entire day. During the night, however, she experienced a severe paroxysm of suffocation, breathed with difficulty, and with a croupy sound, and was obliged to maintain the erect posture. This symptom subsided after an hour's continuance, and she fell asleep.

On the day following it was deemed right to have medical assistance. A short, dry, frequent cough had made its appearance, but the breathing was not sonorous. The pain and difficulty of deglutition was rather increased, and she pointed to the situation of the thyroid cartilage as the seat of her distress. The imperfection of voice continued. Pulse natural as to character, beat about 80 in the minute; her general health good; but though she endeavoured to preserve an appearance of cheerfulness, it was evident she had some anxiety as to the complaint. She said she dreaded the night, lest she should experience a similar attack of suffocation.

On examining the fauces, there was no appearance of inflammation.

Eight leeches were applied to the throat, and some purgative medicine administered, and she was directed to take a draught at bed-time, containing a drachm of oxymel of squill, a drachm of camphorated tincture of opium, ten drops of antimonial wine, and an ounce of peppermint water.

She passed the night tolerably well, but on the next morning the symptoms still continued. A solution of tartarized antimony was now ordered, and she took the sixth part of a grain every second hour, and the draught was repeated this night as on the preceding.

*June 19th.*—She had been under the nauseating influence of the medicine yesterday during some hours, and had been so much annoyed by it that she positively refused to take any more, particularly as she said it did her no good. The symp-



toms still remaining unabated, she was ordered pills containing calomel and opium.

On the 22d her mouth became affected, but only so far as to produce slight tenderness behind the incisor teeth, and to impart a mercurial fœtor to the breath. The improvement in her voice was now very apparent, as she could speak quite distinctly, the soreness in her throat was diminishing, and altogether she was much improved.

In the course of a week she had completely recovered, notwithstanding that the mercury had occasioned a slight dysenteric affection, which rendered it necessary to discontinue its use perhaps a day or two sooner than would otherwise have occurred.

## CASE XXII.

Mary Carr, æt. 50, a washerwoman, applied at the Meath hospital on the 7th December, 1823.

Five weeks previous to this she had been employed in a factory where large fires were used, and obliged occasionally to quit this heated atmosphere to assist in spreading out the cloths to dry. She attributed her illness to having caught cold whilst thus occupied.

At first she had been seized with slight dry cough and hoarseness, which latter symptom had so far increased, that at the end of the second week she was nearly deprived of voice. She had never experienced any difficulty of deglutition or sore-

ness in the throat, nor had she shivering, headach or fever, previous to the attack.

On examining the fauces, there was no mark of inflammation, but pressure externally on the thyroïd cartilage gave pain and excited cough. Her respiration was quite free from any apparent obstruction, and she could draw a full inspiration without uneasiness. Her voice was greatly impaired, and her attempts at speech with difficulty understood. She stated that she had suffered some severe paroxysms of suffocation at night, which had frightened her a good deal, and that frequently she had been obliged to remain in the erect position during two or three hours at a time.

She had pills of calomel and opium; and it required no more than four days to relieve the laryngeal symptoms. She suffered very severely afterwards from the effects of the medicine on her mouth, and it was sixteen days before she had completely recovered.

### CASE XXIII.

Eliza Murphy, a servant, æt. 27, admitted into the Meath hospital. March 1st, 1821.

She complains of difficulty of breathing, which has now continued more than six months, and which commenced without any cause that she is acquainted with. She has not cough, nor does she recollect ever to have been troubled with this symptom. There is no difficulty of deglutition, nor can any appearance of inflammation be observed in the fauces; but there is great tenderness to the touch in the situation of the thyroïd

cartilage, and she cannot endure even gentle pressure in that direction. Common ordinary respiration is apparently quite free, but a deep inspiration is accompanied by a harsh, sibilous noise. Her voice is extremely indistinct. She states that she has had three blisters applied in different situations about the throat, and it was immediately after the first of these that her voice became so much impaired. Pulse regular—appetite good. She passes her nights comfortably, without any spasmodic exacerbation.

*March 2.*—Eight leeches were applied to the throat, and some purgative medicine, which contained tartarized antimony, was ordered.

*March 3.*—No benefit derived from the treatment of yesterday, and she had pills of calomel and opium—one to be taken three times a day.

*March 10.*—Her mouth becoming sore with strong mercurial fœtor from the breath. There is some alleviation of the laryngeal affection, but not so distinctly marked as to be worth reporting.

*March 12.*—Some slight uneasiness in the bowels. A draught of oil of castor and tincture of opium ordered.

*March 15.*—Her voice completely restored: no difficulty of respiration, nor any soreness of the throat.

*March 21.*—Discharged cured.



## CASE XXIV.

## PHTHISIS LARYNGEA.

*March* 18, 1820. Mary Smith æt. 31 years, unmarried. Has been ill with difficulty of breathing for two years, gradually growing worse during that time. Applied to several medical practitioners and charitable institutions: received many different medicines, has been frequently bled and blistered, but without the smallest benefit.

She is a young woman of the better order, well educated, and apparently of strong mind: she can describe accurately every sensation she has felt, and is convinced that her case is beyond the reach of human assistance: she speaks calmly of her approaching dissolution, which she is satisfied is very near at hand.

She says that at first she experienced little inconvenience beyond a dryness and huskiness in the throat, which was very disagreeable, with an occasional attack of strangulation at night. After some time her throat became sore, and she described her pains to have been only temporary, and then shooting across the neck, as if a sharp instrument had been run through it. The next symptom was what she called a thick-ness in her breathing, and a frequent necessity for drawing a full inspiration or filling her chest. About this time she felt a great difficulty of breathing at night, and was at times entirely deprived of her rest.

These symptoms existed full a year before she remarked her cough: she stated it to have been very troublesome, and ac-

accompanied with a yellow thick expectoration. It was peculiar in this, that it never attacked her in any violent degree, a single cough being sufficient to bring up the expectoration. She had no pain in the side, nor ever complained of any uneasiness, except a perpetual soreness in the throat.

When I saw her she was panting for breath, drawing each inspiration long and full, the expirations being comparatively easier. She coughed incessantly, and the matter thrown up was thick, puriform, and streaked with blood. Her voice was extremely indistinct, and though fond of talking, it seemed to be only with an effort that she could articulate. She complained constantly of her throat; and pressure on the thyroïd cartilage gave her great pain: she was pale, emaciated, and had an indescribable expression of anxiety in her countenance.

On the evening but two after I had first seen her she was seized with a paroxysm of suffocation, and died after about three minutes' struggling.

#### DISSECTION.

The body was examined ten hours after death. The tongue, os hyoïdes, and part of the trachea taken out: this was slit open posteriorly, and it appeared that an abscess had existed immediately in the situation of the crycoïd cartilage, which had burst just behind the rima glottidis, and furnished most of the purulent expectoration already mentioned. The entire of the posterior portion of the cricoïd cartilage was gone, and the sides appeared to consist of an earthy gritty substance that crumbled to pieces under the knife, mixed up with pieces of bony matter, irregular in shape and detached, having very

much the appearance of exfoliating bone. I could discover no trace of the arytenoid cartilages.

The mucous membrane was thickened and puckered in such a manner as entirely to obliterate the natural appearance of the larynx. The epiglottis was much thickened, and seemed somewhat smaller than usual, as if a part had been removed by ulceration. This, however, was not the case, and the appearance was entirely owing to the irregular thickening of the membrane. The surface of the membrane was rough and studded with floating points of an adventitious substance, which gave it very much the semblance of having suffered from extensive ulceration. It had, however, no distinctive character of ulceration except at the spot where the abscess had burst.

The smell from the cavity of the abscess was abominably fetid.

The cavity of the thorax presented no marks of recent disease: there were a few adhesions on the left side, but they were evidently of long standing. The substance of the lungs was cut into, but shewed no marks of disease.

### CASE XXV.

Patrick Killeen, æt. 33 years, admitted into the Meath hospital on the 1st December, 1823.

He complains of occasional difficulty of breathing, which is aggravated by spasmodic exacerbations, particularly at night. He seldom coughs during the day, but this symptom is ex-



tremely troublesome throughout the entire night, The expectoration floats in water, and appears streaked with blood. He experiences great relief after freeing himself from this slimy expectoration. His voice is nearly lost, yet he breathes without noise : however, as he lies, the muscles of his throat may be observed in strong action. Pulse 136 ; tongue rather clean ; appetite good.

When questioned as to the situation of his uneasiness, he points externally to the thyroid cartilage.

The disease has been now of nine months' duration, but it is only within the last month that the symptoms have become so very severe.

He was ordered pills of calomel and opium.

*December 5.*—No alleviation of symptoms : he complains of great fatigue in consequence of want of sleep : he says that the violence of the cough prevents his taking rest ; but he has also one or two paroxysms of difficult breathing every night. Pulse 140, without any other accompanying symptom of fever.

The mercury was continued, together with opiates and antispasmodic medicines.

*December 9.*—Passed a very bad night with cough and difficulty of breathing. There seems to be a great spasmodic exertion to perform the act of inspiration. Pulse 140, small and hard. The mercury has not affected his mouth.

*December 10.*—This evening he was seized, as usual, with a spasm of dyspnœa, which seemed to come on with increased

severity. He was placed erect in his bed, and soon afterwards making signs of great distress, he struggled convulsively for two or three minutes, and dropped dead.

#### DISSECTION.

On slitting open the larynx\*, the cricoid cartilage appeared to be highly vascular and organized. Its substance was internally as red as blood, and in three or four places there were specks of an earthy white substance that crackled under the knife, and was evidently of the same nature with that usually found in caries of the laryngeal cartilages. The mucous membrane was quite sound, except a very small speck of ulceration beneath the left ventricle. It exhibited its usual healthy colour except just at this spot, where there was a blush of inflammation about half the size of a sixpence.

The lungs and the cavity of the thorax were both healthy.

#### CASE XXVI.

On the 15th April, 1822, William Graham, æt. 33 years, was admitted into the Meath hospital under the following circumstances :—

About three months before his application at the hospital he was attacked by sore throat, accompanied with sonorous breathing, and an excessive pain and difficulty in swallowing. He now complained of difficulty of breathing, accompanied by a hoarse hissing noise, as if the passage for the air was too small;

\* The preparation has been preserved in the Museum of the Park-street school.

and his respiration was so laborious, that it could be heard at the distance of several yards. He had frequent, hollow-sounding cough, and was teased with an accumulation of thick discoloured mucus, which caused almost convulsive struggles to expectorate. The fauces exhibited no marks of inflammation; the epiglottis, however, could not be brought into view. His voice was almost lost, and when he did attempt to speak, the hoarseness and hissing of the sound rendered it difficult to be understood. He complained of oppression about the chest, but no pain in it, neither were his attempts at respiration accompanied by very violent muscular efforts. Pressure on or near the larynx occasioned very great pain, and he felt a sensation of burning heat within it. Sometimes he would express his conviction that an ulcer was somewhere low down in his throat. His countenance was pale, sunken, and anxious: his eyes protruded; the tunica conjunctiva suffused and of a pearly whiteness. Pulse 100; appetite good; tongue clean and natural.

Doctor Graves, under whose care this patient was admitted, had him at first bled both locally and generally, and his bowels regulated, with a view to the subsequent exhibition of mercury. During three days he took the submuriate of mercury in large doses; but it had little constitutional effect, in consequence of passing off too freely by the bowels. He had then two large blisters applied to the fore part and sides of the neck, which causing a good deal of pain and irritation, and rather aggravating than relieving the dyspnœa, were allowed to remain on only a few hours. On the fifth day after his admission, he coughed up a piece of calcareous matter, apparently ossified, after which his respiration became easier, and he continued rather to improve until the 28th April, when all the symptoms of difficult respiration returned with redoubled violence. His breathing had always



since his admission been harsh and sibilous : it now became so loud as to be heard below stairs in another apartment. He struggled a good deal, and was obliged to use considerable muscular exertion. His cough had subsided, but he felt pain in the chest, with soreness on pressure. He also suffered from occasional exacerbations, when the dyspnœa was so great as at times to threaten suffocation. From these he was partially relieved by the exhibition of ipecacuanha and tartarized antimony ; but, on the whole, the disease had gained ground, and was making rapid progress, when the period of Doctor Graves's attendance on the hospital having expired, and it being probable that surgical aid would speedily become necessary, he requested me to take charge of the case.

Although this was one of the most unpromising cases that could occur, yet something was to be attempted for its relief. Bronchotomy held out but very faint hopes, and therefore it was determined only to resort to it as a last resource ; and it was not undertaken until symptoms of distress appeared such as would have terminated the patient's existence in a few hours. I performed the operation on the evening of the first of May.

At first the great relief experienced might have encouraged strong expectations of recovery ; he lay quietly, breathed freely through the wound, and expressed by signs his gratitude for the ease he had obtained. He was now ordered mercury again, and had ten grains of calomel twice or thrice a day during seven days, at the end of which time his mouth became extremely sore ; but there was no abatement of the original disease in the larynx. His spirits, however, were good ; the expression of anxiety entirely removed from the countenance ; his

appetite almost ravenous: his pulse always remained a little accelerated, but the soreness from external pressure on the throat had entirely subsided. When mercury is of service in cynanche laryngea it is so at once, and here it unfortunately promised nothing; for on the eighth or tenth day, when the external wound was stopped for a moment, it became evident, from the return of the patient's distress, that the disease had not yielded in the smallest degree. The medicine was therefore discontinued without any other being substituted, unless occasionally an aperient draught for the purpose of regulating the bowels.

A fortnight after the operation, it was observed that he breathed partially through the glottis: he smoked his pipe, and appeared to derive much pleasure from it: he spoke too, but in a rough, hoarse, indistinct tone; yet for a moment could he not endure the entire closing of the wound. He had cough, and expectorated large quantities of mucus, which passed freely through the artificial opening. The wound was healthy, appeared healing, but the air that passed through it in expiration was impregnated with an abominably fetid odour, like that proceeding from gangrene. On the 23d day his health became visibly altered for the worse. His cough increased, whilst his strength diminished: his pulse became small and quick, always above 120: he was emaciated, and seemed sinking with rapidity. He was now sent to the country, where for two or three days he seemed to improve. He was able to walk about the roads and fields, and took pleasure in being in the open air. His cough, however, increased, and for a day or two before death never quitted him even for a moment. At last he appeared unable to expectorate; pain seized him in the breast, with

great restlessness and wish to change his posture; and on the evening of the 30th he died exhausted.

DISSECTION,

*Eighteen hours after death.*—The trachea, larynx, and œsophagus being removed from the body, the lining membrane of the larynx appeared greatly thickened and corrugated; it was covered in many parts with flakes of coagulating lymph, which adhered but loosely, and floated into the larynx. Half the epiglottis appeared to have been destroyed by ulceration; but hereabouts there seemed to have been some attempt at reparation, as there was evidently a recent cicatrix in the membrane covering it. The natural aperture of the larynx seemed completely shut up by the thickening of the membrane, and its posterior part was involved in ulceration. On slitting up the œsophagus an ulcerated aperture appeared in its anterior part, about an inch below the opening of the larynx, and a piece of loose carious bone was found sticking in it. This led into the cavity of an abscess which occupied the situation of the broad portion of the cricoïd cartilage, at the posterior part of the larynx. On opening into this abscess, two portions of irregularly shaped carious bone were found loose: the entire of the middle part of the cricoïd cartilage was destroyed: the sides that remained were denuded of their covering of membrane, and converted into a white cheesy substance, mixed with calcareous particles, soft, but gritty under the edge of the knife: these were in progress to separation also. The arytenoïd cartilages were destroyed on both sides. This abscess appeared to have burst by ulceration in two places, one immediately behind the rima glottidis, and one at its most depending position into the œsophagus: through this latter the diseased bone was



making a passage, and through it that portion which was coughed up had probably come. The lining membrane of the trachea was thickened, puckered and swollen in its whole extent down to the bifurcation of this tube, beyond which it was not examined, and the windpipe was filled with serous fluid that rose in it as high as the wound that was made by the operation, through which it trickled. The larynx, &c. is preserved in the museum of the Park Street school.

### CASE XXVII.

*November 28, 1829.*—A man named Miles Brady, æt. 24, very strongly and powerfully made, applied at the Meath hospital for relief of a difficulty of breathing.

There is great dyspnœa, each inspiration being attended by a sibilous noise that particularly marks a narrowed condition of the rima glottidis. There is occasionally a harsh ringing cough, without expectoration, and there are spasmodic exacerbations of both these symptoms, occurring at short intervals, and bringing the patient to the verge of suffocation. The larynx and trachea are seen to move rapidly upwards and downwards in the neck; but the muscles, which are sometimes seen in powerful action, cannot be observed in this case, owing to a swollen condition of the throat. There is great tenderness in the region of the thyroïd cartilage, and the patient states that he has both pain and difficulty in swallowing. On examining the fauces, however, as accurately as possible under the circumstances, no appearance whatever of inflammation can be discovered. The state of the epiglottis cannot be ascertained. The face is flushed and swollen, but not purple; the lips have a tinge of livid-

ity: the eyes are white and prominent; the forehead bedewed with sweat; and there is an indescribable expression of anxiety and distress in the countenance. Pulse 100; small and feeble.

The stethoscope indicates that the lungs are sound, and that there is no bronchitis; but the instrument is liable to fallacy in this case, for two reasons: 1, From the lungs receiving a diminished supply of air; and, 2, in consequence of the existence of emphysema in the lung.

The neck and upper part of the thorax were remarked by a pupil as being emphysematous. Having never observed this symptom in any previous case of cynanche laryngea, my attention was not drawn towards it; but there can be no doubt of its existence. He was bled to syncope, and ordered to have a bolus containing 10 grains of calomel every third hour.

The above report was taken at ten o'clock in the morning; at 2 P.M. the patient was again visited, and the symptoms found so urgent, that it was deemed necessary to have the operation performed without delay.

At half past three the patient's bed was wheeled into the operating theatre, and the man being placed on it with his head towards the light, and his neck extended as much as possible, an incision was made, commencing near the sternum and carried upwards to the cricoid cartilage exactly in the central line of the neck: this was carried deeper, and the muscles divided, and then it was that one particular difficulty in this operation became apparent. As has been stated, I had not remarked the emphysema of the neck; yet now the blood, mixed with air, bubbled and gurgled up through the wound, and ob-

secured every thing in the way of anatomical dissection. One small artery was cut and bled, and it was necessary to secure it by ligature. On proceeding deeper still, the difficulties increased. From experience, I was fully prepared to find the trachea much deeper than could be anticipated from any dissection of the dead subject; but here the distance from the surface seemed immense, and I had proceeded to the depth of more than two inches before the trachea was laid bare. The motion of this tube upwards and downwards always creates considerable difficulty in the operation, and I tried to obviate it here with some partial success. I laid the nail of the forefinger of my left hand against the inferior prominence of the cricoid cartilage; and thus fixing the tube, I made a semilunar incision into it, and passed a tube formed of a gum-elastic catheter through it.

In all cases of tracheotomy when the aperture is made in the windpipe, the patient experiences an indescribable degree of distress: he starts up, looks wildly, coughs with violence, and, as the blood trickles into the trachea, makes almost convulsive efforts to be rid of it. In this instance the patient's struggles were excessive; his face became almost literally black, and it required some time before the operation could be finished.

*Nov. 29.*—Patient expectorates a good deal of mucus from the wound, and some by the mouth. Pulse above 100.

Venesection, and the calomel in 10 grain doses as already ordered, to be continued.

*Nov. 30.*—Pulse 105, and soft; his mouth slightly affected by the mercury. Occasionally very difficult respiration, in



consequence of the inspissated mucus in the wound, and a small valvular portion of the trachea that in the operation was only partially detached. Bronchitis very intense.

Venesection to 16 oz.

To have pills of calomel and antimonial powder every fourth hour.

*Dec. 1.*—Was bled last night again, and had not any sleep. This morning I find him not much better; his face is flushed and anxious, and he breathes with difficulty; complains of pain in swallowing, and of very considerable uneasiness in the throat. I endeavoured to cut away the loose portion of the trachea which appeared to incommode his breathing, and succeeded in removing a good deal but not the entire of the offending substance: it was almost impossible to lay hold of it, in consequence of the depth of the wound.

Venesection again; and the blood is both cupped and buffed. There is great distortion of countenance when he endeavours to expectorate.

*Dec. 2.*—Patient, although having but little sleep, is decidedly better to-day. He lies quite tranquil and composed, and with the exception of the assistance necessary to be afforded in all such cases in catching the mucus and preventing its being again sucked in through the wound, gives but little trouble.

The expression of his countenance is greatly improved. Complexion of a bright florid red. The emphysema of the neck and chest not in the slightest degree diminished.

On the evening of this day, in consequence of too great freedom of the bowels, he was ordered calomel and opium.

*Dec. 3.*—Patient's mouth very much affected by the mercury, and he makes signs that he can swallow without much

difficulty. Pulse 84, and rather soft. The stethoscope indicates that the bronchitis has been removed, and there is reason to believe that the lungs are not otherwise engaged. The emphysema is as extensive as ever.

Venesection to be repeated.

The patient was visited again this day at three o'clock P.M. and found lying on his side, asleep; he breathed through the wound as tranquilly as any man can do in his most perfect health.

*Dec. 4.*—Slight mercurial fœtor from the breath, and on closing the wound he says his mouth is a little sore: the voice is raucal; pulse 84, soft; slight bronchitis on both sides indicated by the stethoscope.

Bled to 12 oz.; blood deeply buffed.

Bled again in the evening from the foot.

Calomel and opium continued.

*Dec. 5.*—Slept six or seven hours last night, and appears better; expression of the countenance very good; but on closing the wound he can neither speak nor breathe, although there is actual salivation. Pulse 84, and soft; bronchitis slight on the left side. The medicines to be continued: emphysema greatly diminished on the neck; none below the clavicle.

*Dec. 13.*—Since the last report, no alteration worth remarking, except that he has been teased by occasional paroxysms of dyspnœa, which he attributes to a partial closure of the wound in the neck, and which appears to be relieved on its being dilated with a common dressing forceps. On closing the wound

he can speak in a very hoarse tone ; but the passage of the air through the natural opening must be very trifling, as he cannot endure the closure even for a moment. On this day I endeavoured to introduce a catheter from the wound upwards through the larynx; a manœuvre by which I had once before succeeded in breaking an abscess ; but in this case the instrument could not be passed, and on its withdrawal its extremity was deeply stained by sulphuretted hydrogen.

*Dec. 15.*—Emaciation very great, and there is a small circumscribed red spot over each cheek-bone ; pulse about 96 ; appetite moderately good ; has had some perspiration last night, and did not sleep in consequence of a most harassing cough ; the expectoration more abundant, and very foetid ; the smell from the wound odiously offensive ; but the most alarming symptom, and one which may be considered generally as fatal\*,

\* I have left this passage precisely as it occurs in my case-book, taken at the time, when I regarded phthisis laryngea as destructive, and this symptom as particularly unfavourable, inasmuch as it indicated the existence of an abscess in the larynx which had burst into the pharynx, and thus established a communication between the two canals. As if, however, to prevent the possibility of reasoning generally on subjects connected with disease, it has been lately ascertained, that the food and drink may escape through a wound in the windpipe without any structural lesion of the larynx or trachea. In such cases it seems as if the epiglottis had ceased to perform its function, and freely admitted into the windpipe substances introduced into the pharynx for the purpose of deglutition. The Wapiti deer that was bronchotomized by Mr. Crampton in the Zoological Gardens, exhibited this phenomenon, and portions of chewed grass, &c. constantly escaped from the wound ; although it was demonstratively established, by dissection after death, that no unnatural communication between the pharynx, œsophagus, and windpipe, existed in any place. A similar circumstance was observed in a girl admitted not long since into the Richmond hospital, for a deep wound in the lower part of



occurred yesterday evening, when some fluid which he attempted to swallow passed out through the wound in the neck.

*Dec. 16.*—Patient nearly as yesterday, except that he suffers amazingly from dyspnœa, which he attributes to the closing of the wound. He speaks tolerably distinctly, but with an effort; cannot bear to trust to respiration by the natural passage, even for a moment. Every fluid he attempts to swallow escapes by the wound.

*Dec. 20.*—A silver canula of tolerably large calibre has been introduced through the wound, and the patient has since breathed more easily; but he has still occasional fits of dyspnœa, and they are apparently as distressing as when occasioned by the closure of the wound. Still (on the authority of stethoscopic investigation) the lungs seem to be healthy; but the noise occasioned by the rush of air through the wound interferes with the sound of respiration within the thorax so much, that there can be no certainty in the diagnosis made by the instrument. Emaciation great, accompanied with excessive debility, so that the patient could scarcely be recognised as the large and powerful man operated on three weeks ago. He sweats about the head, breast, and shoulders, whenever he sleeps. Pulse 110, small. Appetite improving; he has asked for meat this day. Fluids continue to pass through the wound in the act of deglutition; but he can swallow solids tolerably well. Cough at times very troublesome; expectoration small in quantity; the smell from the wound continues to be most offensive.

the neck, which opened freely into the trachea: in this individual the fluids attempted to be swallowed escaped through the wound, and no structural derangement of the larynx or unnatural or unusual communication was detected afterwards on dissection.

*Dec. 22.*—Has yesterday coughed through the wound a portion of the larynx, apparently the arytenoid cartilage with its corniculum attached: it is earthy, and not very unlike an exfoliation from a bone. A larger sized tube, the diameter of which is fully three-eighths of an inch, has been introduced, and since that has been done his respiration is as tranquil as can possibly be imagined. He can swallow solids very easily, and fluids better than he did. Pulse very small, and beats about 48 strokes in the minute; appetite good; strength rather improving.

*Dec. 28.*—To look at this patient, one might suppose him to be in perfect health, excepting the circumstance of the artificial respiration: his complexion is clear; the expression of his countenance tranquil; his sleep refreshing; his appetite improving; he still passes part of his drink by the wound, but it is probable the internal ulceration is healing, as there is now scarcely any fetor and no purulent expectoration. However, on closing the wound he cannot succeed in carrying on respiration in the natural way for a single minute; he makes a good attempt at speaking, but in a very hoarse, rough tone.

On the 13th January following, he left the hospital quite recovered, except that he was obliged to breathe through the tube, in which condition he has remained ever since. The history of this man, if it could be accurately obtained, would be curious in other than a medical point of view. He imagined that his suffering and extraordinary cure entitled him to a pension, or at least that he should be supported without any exertion of his own; and under this supposition, I am informed, he played some very extraordinary freaks. He was also convinced that he could not be hanged, and altogether entertained a number of fancies that led to very curious results. About three years

after the operation the tube became corroded, and broke across, a portion of it dropping into the trachea, where it occasioned great distress, but was removed without difficulty. He has since continued quite well, and, though breathing through a tube, earns his livelihood at the laborious occupation of a stone-cutter.

### CASE XXVIII.

#### MORTIFICATION OF THE LARYNGEAL CARTILAGES.

Richard O'Leary, æt. 32, a sailor, admitted into the Meath hospital July 15, 1825.

The history of this case previous to admission could not be very satisfactorily ascertained; he seemed to think his illness had some connexion with a venereal taint, yet denied having had any syphilitic symptom during the last five years. Has been married three years, and his wife is a healthy young woman. The disease under which he suffers appeared about eight weeks since, during which time he has been taking medicines of different kinds, principally mercury.

He appears to breathe with great difficulty and considerable muscular exertion; respiration attended with a hissing sound; voice hoarse, with a peculiar ringing tone; no cough, but there are severe spasmodic exacerbations every night.

On examining the fauces, a large broad ulceration appears on the back of the pharynx, very yellow in colour, and seemingly disposed to spread.



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On being admitted he was put under a regular mercurial course; but his mouth could never be affected. He had opiate draughts each night for the purpose of allaying the spasms, with occasional warm baths and gently aperient medicines, but to no purpose: he gradually became worse, and on the morning of the 25th I was called to him, as being in danger of instant suffocation.

When I saw him, he was walking about in the greatest agony and distress, grasping at every thing he could lay hold of in order to assist the muscles of respiration. His voice was altogether gone, and his breathing could be heard at a very considerable distance. Pulse quite regular, and he did not complain of pain. There was slight soreness in the situation of the thyroid cartilage.

As he had frequently before exhibited symptoms nearly as alarming, in consequence of spasmodic attacks, I imagined these might be of the same nature, and I only ordered a strong opiate draught, with a view of allaying present irritation.

At twelve o'clock the symptoms became still more urgent, the difficulty of breathing had greatly increased, and the patient seemed almost exhausted; he, however, objected to the performance of any operation, and it was only when he felt he had but a few minutes more to live, that he at length consented. When his bed was wheeled into the operating theatre, his respiration was scarcely perceptible; his pulse was quick, very small and hard, and a cold clammy sweat hung on his face, neck, and chest.

I commenced the operation by an incision about an inch and a half in length, extending from below the cricoid cartilage to

half an inch above the sternum : by a second stroke of the knife a large vein was wounded, and the patient lost about four ounces of blood. He was now so much exhausted as not to allow of a moment's delay, and I finished the operation by plunging the knife at once into the trachea, and dilating the wound by drawing it a little upwards. A silver canula was then introduced.

After the operation, the exhaustion of the patient continued ; his pulse became weak and faltering, and notwithstanding the administration of cordials, &c. he was sinking fast. He seemed at intervals to cease respiration for more than a minute at a time, and had lost the power of swallowing perfectly. About half-past one o'clock, after a considerable struggle, he succeeded in expelling a quantity of bloody mucus and some flakes of hard coriaceous lymph, which had evidently been the products of inflammation. The pulse, notwithstanding, continued to sink, and the debility became more and more alarming, until about half-past three o'clock, when he expectorated nearly half a pint of mucus, and was greatly relieved. A syringe was applied to the wound, and an additional quantity of the mucus removed in this manner. From that moment he rallied ; and I saw him at six o'clock in the evening, sitting up, and quite cheerful. Respiration through the wound free ; expression of countenance changed ; lips have resumed their natural appearance ; pulse regular.

*July 26.*—Slept well during the night, and is calm and cheerful this morning ; expectorates freely through the wound, but the smell is abominably fetid.

*August 1.*—He has, to all appearance, been progressively improving as to respiration ; but this day I observe that any liquid

he attempts to swallow is partly expelled through the wound, and deglutition, with respect to solids, is impossible. There is an appearance of considerable fulness in the situation of the larynx toward the right side, without pain or discoloration; but the tumour pits on pressure.

*August 5.*—The wound has a strong disposition to heal; the fulness and œdema of the neck continue. He can press a quantity of matter into the pharynx by rubbing the tumour, and then expectorate it. Its smell is insupportably fetid.

*August 7.*—An incision was made into the side of the neck, which opened the cavity of the abscess without producing any discharge of matter. The abscess was now found to communicate both with the larynx and pharynx, and was excessively putrid. A large quantity of slough was removed, amongst which was a portion of the right ala of the thyroïd cartilage.

The patient bore this second operation well, and, considering his sufferings, both his general health and spirits seem wonderful.

*August 8.*—It was now found that every thing, both solid and fluid, which he attempted to swallow, passed out through the wounds in the neck. A tube was therefore introduced through the last wound into the œsophagus, and the patient then presented the singular appearance of a man breathing through one wound in the neck, and artificially fed through another.

*August 10.*—In the evening of this day, he was suddenly seized with convulsion, and died almost instantaneously.



## DISSECTION,

*Eighteen hours after death.*—A large abscess existed in front of the larynx and upper part of the trachea, in which the thyroïd cartilage lay like a foreign substance, entirely denuded, mortified, and abominably offensive. The front of the cricoïd cartilage, and of the two upper rings of the trachea, had been removed by mortification also. The lining membrane of the larynx was thickened, corrugated, and had a granular appearance: part of it was ulcerated, through which the abscess had communicated with the pharynx. The tracheal membrane was also thickened, vascular, and in many parts covered with patches of flaky lymph. The ulcer in the throat had healed, and the pharynx (except at the spot already mentioned) appeared perfectly healthy.

The preparation is preserved in the museum of the Park-street school.

## CASE XXIX.

Catherine Young, æt. 30 years, unmarried, of a weakly delicate constitution, applied as an external patient at the Meath hospital on the 21st July 1824, complaining of sore throat, difficulty of deglutition, and pain in the situation of the thyroïd cartilage. There was considerable hardness and tumefaction on the front of the throat, but no discolouration of the skin. The fauces presented no appearance of inflammation whatever. There was some fever, quick pulse, furred tongue, loss of appetite, and she has had one rigor.

The tumour in the neck was poulticed, and on the 26th it burst and gave exit to a quantity of matter of an abominably foetid odour mixed with mucus: she had attributed her illness to the swallowing of a small bone, and this was now searched for, but could not be discovered, neither could any thing of the kind be found about the neck.

On the 30th the tumour had greatly diminished in size, but the pain on swallowing or coughing had rather increased. She spoke in a low hissing voice, and with great difficulty. There were two ulcers on the neck, corresponding with the upper and fore part of the thyroïd cartilage; these ulcers were about half an inch in diameter, and communicated with the trachea; so that, on coughing, the air rushing through them disturbed the flame of a candle. Large loose portions of the thyroïd cartilage may be seen at the bottom of the sores, of a dark brown colour, and the discharge is almost insupportably fetid. The cough is short, frequent, and troublesome; the expectoration copious, respiration quick and laboured. Patient cannot lie down, and has had no sleep during the last few nights.

She said the fluids she attempted to swallow were occasionally discharged through the wound.

On the 1st of August she died, and her friends would not permit a dissection of the body. However, whilst examining the sore in the dead body, I pulled out with a forceps nearly half the left ala of the thyroïd cartilage, brown, fetid, and putrid; the edges softened as if by maceration, the centre hard, but more resembling the appearance of horn than of cartilage.

## LARYNGITIS FROM SWALLOWING BOILING WATER, THE STRONG ACIDS, &c.

Effects of swallowing Caustic Poisons—of Boiling Water—Variety of Symptoms—Pathology—Symptoms when Recovery takes place after Caustic Poisons—Pathology and Symptoms from swallowing Boiling Water—Treatment—Bronchotomy—Causes of its frequent failure—Case.

SOME of the most beautifully successful operations of bronchotomy that have ever been performed were undertaken for the relief of the accidents that form the subject of this chapter; at the same time that I believe there is no case in which it has been so often found to fail. To understand this position rightly, it must be borne in mind, that there are a vast number of circumstances that modify the results of such occurrences, and may aggravate the symptoms in one individual and mitigate them considerably in another. These will also tend to explain the differences of symptoms and of suffering during life, and the variety of pathological appearances discovered by dissection after death. It is not my intention to enter into a protracted discussion, which would, in some respects, be foreign to my general subject; but it will be necessary to take a cursory view of these accidents, in order to understand how far the operation may be useful, and the cases to which it is applicable.

Caustic poisons are sometimes made use of by the determined suicide, and in such cases are swallowed well, notwithstanding their irritating nature, and the actual pain they must occasion. I have known a young girl, after taking sulphuric



acid, sit quietly and drink tea with some females, who were afterwards suspected of poisoning her, although the dose had been so powerful that she died in a few hours; and I am aware of a man who took a second glass of the same acid, because he thought the first was not sufficiently quick in despatching him. In all these cases the larynx is never injured; there is no difficulty or interruption of respiration; and, although the surgeon may have arduous and important duties to perform, the operation of bronchotomy is not amongst them. But if one of these poisons is taken accidentally, as in the case of a rogueish fellow mistaking a glass of aquafortis for whiskey, and attempting to toss it off without discovery, the result is completely different: all the muscles of the larynx and pharynx are thrown into sudden and violent contraction, and the fluid is forcibly expelled through the nostrils and mouth, all of which parts are injured. In some of these cases, but not in all, the larynx becomes subsequently attacked by acute inflammation; and it may be necessary to have recourse to the operation, in order to enable the patient to breathe.

In the instance of boiling water, as the fluid is never designedly taken, I believe it is never perfectly and completely swallowed; at least, I have not met with pathological evidence of its having reached the stomach, although in some, I have been assured by the little sufferer's mother, of its having actually taken two or three gulps. It appears to be almost inexplicable how such an accident could occur: the intense pain it must instantaneously occasion in the mouth, and the excitement it must produce in the fauces and the muscles of the larynx, render it scarcely credible, that a fluid so very irritating could actually be swallowed: if it was so, it would probably create a degree of gastric inflammation, very likely to prove fatal. In

many, perhaps in the majority of instances, the fluid itself is not introduced into the mouth, the child being scalded by the steam before it can take in the water: sometimes, however, it is not only drawn into the mouth, but expelled again forcibly through the nares, which latter parts may thus be slightly injured. It appears, then, that all these accidents, in their general features, bear a strong similitude to each other: in their particular details, however, there is a very considerable variety, arising from the intention of the patient; the fact of the deleterious substance having actually reached the stomach; the quantity taken in; and, obviously, its strength or state of greater or less concentration.

Will these varieties explain the uncertainty of success that attends the operation of bronchotomy when applied to the relief of these accidents? The mischief that renders such operation necessary is the presence of inflammation and swelling within the larynx, to an extent that interferes with the transit of the air through the glottis. In several cases this obstruction never takes place. I have seen five instances of persons having swallowed sulphuric acid, two of which recovered; and in none of them were there symptoms of difficult or obstructed respiration. In others, again, there are such symptoms, but they are slight, or, being severe, they yield readily and quickly to decisive antiphlogistic measures. In a third class, the danger of suffocation is imminent, and the operation imperatively called for: and if the mischief present was confined to the larynx alone, it ought to be, and probably would be, as successful in this as in any case of laryngitis. But there is generally some unfortunate complication, and I know of no case in which it is so difficult to arrive at the truth. Persons who have attempted suicide are usually sullen and sulky, will give no information, and permit no examination. I have seen a young girl that swal-

lowed dilute sulphuric acid because her mistress taxed her with dishonesty, and who, probably, owed her safety to the circumstance of having breakfasted, and her stomach being full at the time; in whom the nature of the occurrence was only discovered by the effect of some of the acid that had been spilled on a part of her dress. In the class of patients that suffer from boiling water, it is equally difficult to ascertain either the extent or severity of the injury. The child may be, and usually is, unable to explain what has happened; and the very occurrence of the accident almost implies the absence of any person of common sense and discretion. Hence, the surgeon is obliged to rely upon the results of his own examination, which is generally unsatisfactory; he waits until he is driven to the operation by impending suffocation; he performs it as a last resource, and the patient nevertheless dies, though not of the laryngeal affection. On the other hand, many cases of an unpromising character recover under the use of antiphlogistic measures, without the operation having been had recourse to at all. Thus, some practitioners have been led to entertain an opinion, that bronchotomy is not an operation applicable to these cases: that the patient who would recover with it might recover without it; and that if the injury is sufficient to destroy life, it will destroy it whether the operation is performed or not.

This is, however, a view of the subject that cannot be admitted. Regarded practically, it cannot be denied that the operation has not hitherto been very successful in these cases; and within my own experience, I have seen it fail more frequently (according to the proportionate number of patients) when performed for this cause than for any other. But I have seen it succeed, and cannot for a moment admit the supposition, that the subjects of these cases would have lived whether it



had been performed or not. The real state of the case is, that the operation is directed to the relief of the laryngeal symptoms alone, but, of course, cannot remedy an injury inflicted on different, and, perhaps, distant organs, of which the surgeon may not be cognizant, and over which he can exercise no control. And if it be true, that some unfavourable cases have nevertheless recovered without operation, it only proves a proposition already admitted, that sometimes acute laryngitis may be successfully treated by antiphlogistic measures; whether it is always politic to place reliance on such treatment is a totally different question.

A great deal, of course, must depend on the quantity of mischief inflicted, and the nature of the parts injured. In a case of the swallowing of sulphuric acid, in which death supervened in a few hours, the root of the tongue and back of the pharynx were found black and charred; the œsophagus in spots and patches was blackened, but, apparently, not disorganized; the lining membrane of the stomach was completely changed; it was quite black and hung loose, flocculent and ragged into the cavity of the organ. The superior portion of the larynx only was inflamed and slightly œdematous. In the case already alluded to as having terminated favourably, the tongue was white, and its integument peeled off on the second day after the accident, like a piece of thick paper, soaked in wet, and curiously marked by pin-holes of different sizes. The sufferings of this creature were extreme, very protracted in duration, and of a character that I have not seen described. After the violence of the gastric symptoms had somewhat subsided, she was seized with symptoms resembling stricture of the œsophagus; the swallowing of any solid material was perfectly impossible, and the attempt attended with great pain; fluids, if taken cau-

tiously, seemed to stop for some minutes in the œsophagus, and then passed the obstruction slowly; but if there was any unguarded haste, they were forcibly thrown back through the mouth and nose. At the same time a most profuse discharge of saliva took place; the hospital tray, which held more than two quarts, was filled three or four times a day with this fluid. When these had been removed, symptoms of an hysteric character made their appearance, with which the patient was, during a long time teased, and more than seven months elapsed before she could leave the hospital. A very few days after the accident, she exhibited some slight symptoms of laryngeal distress, which were soon removed by the application of a few leeches externally to the throat.

In all cases where the accident has occurred by boiling water, the tongue, cheeks and fauces are inflamed, the cuticle detached in spots and patches, and vesications are formed, particularly at the root of the tongue, like those produced by a common superficial scald. The larynx above the rima is also more or less inflamed, and very frequently œdematous: in some cases it is so swollen and puckered as completely to close the glottis. Below the rima, the larynx and trachea are frequently seen perfectly healthy and unaltered, as if the irritation of the heated material had caused a powerful spasm of the muscles here, and prevented its influence from extending farther downwards. Such will be the appearance if the patient has survived the accident only a few hours; but if he had lived two or three days, more extensive lesions will probably be discovered. In a child that died in the Meath hospital about forty-eight hours after the accident, the mucous membrane lining the trachea and bronchial tubes, as far as it could be traced, was inflamed, swollen, and of a deep red colour; the lungs scarcely collapsed on the thorax

being opened, and the trachea was filled with a copious serous effusion, that flowed about the table on the tube being slit open. In another, a dispensary patient, in whom the symptoms were more chronic, and life endured for a longer period, the inflammation of the bronchial membrane produced the true adventitious membrane of croup. Again, the affection sometimes terminates in pneumonia and complete solidification of more or less of the lung. I have not myself yet seen an instance of the lower part of the œsophagus or of the stomach having sustained injury ; a fact which proves how very infrequently the hot water is actually swallowed, and which may possibly be explained by its having been taken accidentally, and without the knowledge or intention of the patient. Neither have I observed stricture of the œsophagus, ptyalism, or any of the other symptoms that are met with in patients who recover after having really swallowed some of the caustic acids.

Immediately on the occurrence of the accident the child cries violently, and if any of the water has been taken in, it is immediately rejected ; the little patient keeping its hand on its mouth, and evidently shewing that this is the part that has been injured. The next symptom observed is a difficulty or impossibility of swallowing, probably from the pain at the root of the tongue, produced by the effort ; and it may be two or three hours before the respiration becomes affected. There are then generally some indications of inflammatory fever, the face flushed, the skin hot, the pulse accelerated, and the respiration more or less croupy. If unrelieved, however, the disordered breathing produces its usual effects ; each inspiration is performed with difficulty, and with a stridulous croupy sound, the face becomes lividly pale, the pulse faltering and indistinct, the skin cold, and the child in general very restless. After a little far-



ther time, every symptom of excitement ceases, the respiration, though difficult, is hurried and gasping, the voice lost, the pulse scarcely to be felt, the lip is pale and livid, and the child lies in its mother's arms listless and languid. Sometimes a convulsion or two may precede death, or else the patient gradually sinks, as if wearied and worn out, and dies without a struggle.

If the termination of the case is not thus rapid, the child has other dangers to undergo, in the different forms of tracheal or pulmonary disease that may possibly supervene, and which are to be combatted by the usual means adopted in similar cases: the result, however, is very uncertain, and such as, in the present state of our knowledge, can scarcely be anticipated by the early symptoms of any given case.

As it is not my province, so is it not my intention to enter into the details of the treatment of these accidents, farther than as the larynx or trachea may be implicated; and we have already seen, that even in these respects the subject is involved in a vast deal of uncertainty. In the commencement, the indication is obviously antiphlogistic; and I scarcely recollect a case, even where bronchotomy afterwards became necessary, in which the application of leeches to the throat in the early stages was not followed by a marked, although it might be only a temporary, relief: and many cases have occurred, in which a perseverance in such a line of practice has been attended with success as decided as it was unexpected. I know not whether this circumstance has influenced practitioners in inducing them to rely on medical treatment, even to the latest possible period, or that the patient's friends refuse their consent, and compel the surgeon to stand idly by until the cold and clammy skin and the gasping respiration prove that the child is actually dying; but

the fact is, that the operation is always delayed too long; at least, it is longer postponed in this than in other cases of acute laryngeal disease, and until the patient's condition is unfavourable for any operation, but more particularly for such as this one, performed on a person of an age so tender.

This may be one cause of the frequent failure of the operation in these cases; but there are other circumstances, both with reference to the condition of the patient, the performance of the operation, and its consequences, that must be taken into account, and will serve farther to explain the uncertainty of its result. For instance, the age of the patient offers an insuperable difficulty, and renders it impossible to gain a precise history of the accident, and an examination of the fauces, or even of the state of the tongue, cannot be easily obtained. And from the moment that croupy breathing has been established, the value of the stethoscope becomes greatly diminished, from the confusion of sound thus created through the chest. Perhaps some little assistance may be derived from attentively observing the laryngeal respiration, for, where bronchitis is present, there is usually as much or even more noise in the act of expiration than of inspiration; whereas, in obstructions of the larynx, the effort and the stridule are confined to the latter alone. In more advanced cases, where pneumonia had supervened, perhaps percussion might be made available; but of its importance as a diagnostic in children I am not very well informed, neither would the discovery at so late a period prove of much consequence.

Another source of failure is in the quantity of blood lost by the little patient during the operation. This is certainly true of all cases of bronchotomy performed on the child, where the

loss is proportionally much greater than in the adult, and sometimes is so profuse as to embarrass the operator, and even bring the patient's life into imminent peril. Now, it is an observation established by the unerring test of experience, that persons who have suffered from obstructed respiration bear the loss of blood badly, and that, in proportion to the severity of the dyspnœa and the length of time it has endured. In the cases of swallowing boiling water, I have already stated that the difficult breathing is allowed to proceed to the utmost limit possible, and I believe that the loss of blood which, except in some cases of extraordinary good fortune, inevitably occurs in the operation on the child, is by no means an infrequent cause of its want of success. There are so few published cases of this accident, that it is impossible to illustrate this opinion by instituting a comparison of them; but within my own observation it has always happened, that the patients, who recovered lost but little blood in the operation, and those who died, sank at once, or within a few hours, and did not live long enough to suffer from bronchitis or any of the other usual consequences of bronchotomy.

In the management of these cases, then, it is evident that a vast deal must be left to the discernment of the surgeon in the first instance, and to his decision afterwards. Where we have such abundant evidence of the occasional success of antiphlogistic measures, I think they should always be adopted, and persevered in until the breathing becomes so affected that there is every *reasonable probability* of the operation becoming necessary. At this crisis it should not only be proposed, but its advantage impressed upon the patient's friends; and although a person might thus be now and again subjected to it without absolute necessity, yet I feel convinced that numbers would be



preserved that otherwise are doomed to perish. Even in extreme cases, although not friendly to the performance of operations, unless on pathological principles, I do not think it ought to be absolutely declined : it affords only a chance ; but it is a chance that should be offered, because in the present state of our knowledge there is much uncertainty, and the records of surgery give encouraging assurances of its occasional success. To these I will only add the following case, as furnishing triumphant evidence of the resources of surgery under apparently the most unpromising circumstances : it was treated under the care of my friend Mr. Adams, who with great kindness has permitted me to place it here.

## CASE.

At nine o'clock on the morning of Saturday the 2d March, 1833, Martha Mills, a fine healthy little girl, aged two years and a month, attempted to take a drink through the pipe of a kettle which was on the fire, and had nearly reached the boiling point. She immediately spat out some of the water, and by her cries her mother was informed of the accident. Every thing that she could devise was immediately done : she brought the child into the cold air, blew into her mouth, and smeared the inside of the cheeks, the lips, and the tongue with cream ; she also put butter into its mouth, which was immediately rejected with a quantity of white ropy mucus. The child continued crying for twenty minutes ; her face became red and flushed, and she pointed to the seat of her suffering by frequently placing her hand on her mouth, all the inside of which presented a white parboiled appearance, and was blistered in several places. She became very restless, her voice hoarse, and respiration hurried.

Three hours after the accident, she was taken to a medical practitioner, who told her parents that unless the operation of tracheotomy was immediately performed she could not survive many hours. Mr. Adams was then called, and proposed operating without delay; but in consequence of the opposition of the parents, could not appoint an earlier hour than three o'clock P.M. They did not keep the appointment, and thus much time was lost, and the chance of saving the little sufferer proportionably diminished. Through the same neglect a farther delay of three hours took place, and it was six o'clock in the evening when she was brought to the hospital, in the following nearly hopeless condition. Respiration 50 in a minute, and performed with difficulty; inspiration attended with a loud croupy sound; the surface of the body cold; the face pale and swollen; the eyes sunken and glassy; the pulse extremely feeble, and so frequent that it could not be counted. In these circumstances it was evident that nothing but an operation could afford the least chance, and it was performed by Mr. Adams in the following manner:—

The patient being placed on a table, with a small pillow under her shoulders, so as to allow the head to decline a little, a transverse fold of the integuments was taken up immediately above the sternum, a bistoury was passed through this, and it was divided exactly in the median line. The next incision with a scalpel was carried deeply through a quantity of fat; the margins of the sterno-hyoid and sterno-thyroid muscles were exposed, and by scraping with the handle of the scalpel and director the thymus and thyroid glands were brought into view, being close together, and united by a fibrous band, which it was necessary to divide. The director was again used, and the trachea was exposed in a very small portion of its extent; a

double hook was then struck into it, by which it was drawn forward, and a piece cut out with a pair of common straight scissors. For some minutes her state appeared very critical; she became deadly pale, and her pulse and respiration scarcely perceptible: however, it was soon evident that she could breathe through the artificial opening; she took a little wine, and was removed to bed. *Very little blood was lost*, and no vessel wounded of sufficient size to require a ligature. Shortly after having been put to bed she fell into a sound sleep, breathing only through the opening in the trachea.

In the course of the night feverish symptoms set in, and she suffered an attack of bronchitis; she coughed frequently, and made efforts to expel a viscid dark-coloured mucus; the pulse quickened; the skin became hot; and she was restless; she could, however, drink without more inconvenience than was explicable by the painful state of the mouth and jaws: thirst very urgent.

The next day (Sunday) she still continued feverish, and required constant watching, the breathing being slightly obstructed by the tumefaction of the lips of the wound. On Sunday night while she slept, it was found by holding a feather before the different passages, that she breathed pretty freely by the nostrils, while the air escaped by the wound also; but this was the case only while she remained asleep. The character of the expectoration was observed to vary in the course of the first week: in the commencement it was dark-coloured, ropy and sanguinolent; then it became puriform; then, less tenacious, more easily expectorated, and of a greenish colour tinged with yellow, resembling gonorrheal matter; finally, it became thin and watery, and resembled the ordinary saliva.



From the time of the operation the relief of the breathing was remarkable; and was it not for the supervention of bronchitis, the child would have recovered without one distressing symptom. She gradually recovered her strength and voice. On the seventh day her parents brought her home; the wound in the trachea and neck was healed on the fourteenth, and the child was restored to the perfect and full enjoyment of its former health.

## FOREIGN BODIES IN THE LARYNX AND TRACHEA.

Difficulties of the subject—Value of Auscultation—Case—How the Accident happens—Sensibility of the Larynx and Trachea—Conditions in which a foreign Body may be placed—1. Impacted in the Larynx—Consequences—Case—2. Loose and moveable within the Trachea—Symptoms—Pathological Results—Cases—3. Fixed in the right Bronchus—Results—4. Introduced from without, and remaining fixed in the spot—Case—Treatment of this Accident—Observations on Bronchotomy as applicable to its Relief—Case.

It is not easy to conceive an accident more immediately distressing, or more certainly fraught with disastrous consequences to the patient, than the admission of a foreign body into any of the air-passages, if it be of such size or shape as will not permit of its expulsion by the efforts of Nature alone. Of course, the qualities of the extraneous material, both sensible and chemical, will modify the symptoms, both as to severity or mildness, and, perhaps, as to their progress also; thus a small, round, unirritating substance will not cause so much suffering as if it was sharp, irregular, or jagged; but, nevertheless, if not removed it tends, sooner or later, to the one inevitable consequence—the de-

struction of the patient. At the same time it must be acknowledged that other circumstances, of the nature of which we are ignorant, seem to influence the progress of these cases, and cast such a shade of uncertainty over them, that it is impossible for the practitioner to calculate the length of time any patient may live, or the manner in which his existence may be brought to a termination. Thus, one person, otherwise in the prime of health and vigour, may perish almost immediately, or in the course of a few hours, whilst others have lived to the extraordinary periods of sixteen or eighteen years; and dissection has shewn that, in some instances, death has been caused by direct suffocation, in others, by bronchitis, pneumonia, phthisis laryngea, or abscess resembling the tubercular cavity within the lung. In short, there is scarcely a pathological condition of the aërial passages that has not been occasionally met with as a consequence of this accident.

In contemplating the history of surgery with reference to this affection, it is most gratifying to observe the advance that has been made within the last few years, and the benefit that must thence accrue to mankind. Doubtless, several cases had been previously observed, for instance, by Louis, Pellatan, and Desault, and for the time most accurately described. In the *Memoirs of the Academy of Surgery*, there are several papers on this subject, illustrated by a sufficient number of cases; but it cannot escape the reader of these details, that almost all the patients perished, principally by reason of the medical men in attendance not having agreed as to the nature of the accident, and the only remedy that could have proved efficacious having been withheld altogether, or delayed so long as to have been of little use. As an apology for such indecision, it must be acknowledged that the rational symptoms indicative of the acci-

dent are not developed during life, with that accuracy which banishes doubt from the mind of the practitioner. It occurs very generally to children, who are unable to comprehend the nature of what has happened, and, of course, incompetent to explain it. Its symptoms are cough and dyspnœa of different characters and various degrees of intensity, and, consequently, it has very probably often been mistaken for croup, angina laryngea, and a host of similar affections. It is an accident, the real nature of which could heretofore only have been demonstrated by dissection; and it is well known that ninety-nine out of every hundred persons that die are sent to their graves without their friends permitting a post-mortem examination. Thus, a child might have been playing with a bead, a bean, or any other substance that it was tempted to put into its mouth: this was passed accidentally into the larynx without its nurse knowing anything of the matter; immediately difficult respiration set in, with cough or other symptoms of croup, or suffocating quinsy; the child was treated for this latter disease—died—was not examined—and there the question was allowed to rest.

The introduction of mediate auscultation as a means of diagnosis has wrought such a change in this branch of surgery, that if it was applicable to these cases alone, instead of being so extensively useful, it would have conferred a most important benefit on the profession, and through it on mankind. It has converted doubt and indecision into certainty; it has rendered the fact of the presence of a foreign body within the trachea cognizable to the sense; and in imparting to the practitioner that confidence which a correct knowledge of his subject alone can bestow, I am satisfied it has already contributed to the preservation of numerous lives. Formerly, this must have been considered as an accident of rare occurrence: it is scarcely noticed



in the systematic works of surgical writers, and the few detached cases that were published, shewed that it either did not happen, or was seldom recognized. In my own experience, I had lived for years without having heard of a single case; but since the stethoscope has come to be universally employed, a most curious and interesting change has taken place, and these cases have seemed to multiply beyond any thing that could have been anticipated. In the autumn of 1829, three successful operations were performed in the Meath hospital alone, for the removal of the stones of fruit from the windpipe, and not a year now passes without some such case presenting. Within the last few weeks I assisted at an operation for the removal of a small pebble from the trachea of a fine little girl: but without dwelling on this part of the subject, I would only refer to the periodical journals, and the cases contained in them, as contrasted with the records of surgery some few previous years. It is needless to ask, Can such a change have been purely accidental? In illustration of these remarks, I shall add the following case, which bears particularly on the subject.

### CASE XXV.

In the month of July 1822, I was requested to examine the body of a child that had died under circumstances which threw considerable doubt on the nature of the case. On the evening of the day but one preceding her death she had been playing in the street, when the shaft of a gig or jaunting-car, in pretty rapid motion, struck her, and the bystanders declared that the wheel had passed over her breast. She was taken up, and in a few minutes so far recovered, as to be able to walk home with-

out assistance; but from the instant the accident occurred her breathing became croupy. She was, at irregular intervals, teased with an exceedingly distressing cough, and suffered greatly from incessant restlessness, not being able to remain for any time, however short, in one position. This state continued until five o'clock in the morning of the third day (about thirty-eight hours), when having arisen for a moment, to allow her father, who had been up all night, room to lie down in the bed, she was seized with a paroxysm of convulsive cough, flung her head in agony on the pillow, and was dead in an instant.

On examining the body, the thorax was the first part to attract attention, from the circumstance of its having been said that the wheel of a car had gone over it; however, on the minutest inspection, not a single trace either of injury or disease could be discovered. The viscera of the abdomen were also healthy, and altogether I had never examined a subject so entirely free from every morbid appearance. The trachea was next to be inspected; and in it, or rather in the larynx, was found part of an almond-shell, its rough and broken edge entangled in the rima glottidis, and placed in such a manner that it effectually closed up the aperture for the transmission of air. The nature of the case was now made evident. The child had the fragment of shell in her mouth at the time she was struck, and either from the fright or the shock had unconsciously swallowed it, and it passed into the trachea. It was rough and irregular on its surface and edges, and its presence must have occasioned great irritation. There were frequent paroxysms of coughing; and in one of these the edge of the shell was thrown into the rima, choked it up, and the child died from direct suffocation.

In this case, the existence of a foreign body in the larynx or trachea\* had never been suspected, nor was I aware that any symptom observed could have warranted such a supposition. It was considered as difficult breathing, resulting from injury of the neck or chest, and was precisely the case to which the most accurate stethoscopic examination would have been applied. I may add, that the intelligent practitioner under whose care it was treated would have detected its real nature in a moment, and that a similar case occurring now could not possibly be followed by the same disastrous result.

It may be remarked, in the first instance, that this accident never happens at the time it is generally considered as most likely to occur, namely, in the act of swallowing. When a person is engaged in the performance of this function, the root of the tongue is depressed, whilst the larynx is elevated : the epiglottis is thus mechanically thrown as a bridge across the larynx, and so effectually closes it, that the smallest morsel, or even a drop of water, can find no admission. As long, then, as the epiglottis is perfect it would appear to be impossible for any substance to pass into the trachea during deglutition ; and even so completely does nature execute her work, that it would appear to be very possible for a patient, in whom this valvular cartilage is altogether deficient, to convey sufficient nourishment into the stomach without much interference with the organs of respiration. But it is different when a man attempts to draw a full inspiration whilst any foreign body is within reach of the current of air about to pass into the lungs. At this time the epiglottis is raised, the rima glottidis is distended, and every thing appears to favour the entrance of the air,

\* The preparation of the larynx and trachea, with the almond-shell *in situ*, is preserved in the Museum of the Park Street school.



and of course of whatever it bears along with it. Thus, a person holding a sup of wine in his mouth, to enjoy the flavour, incautiously attempts to breathe : a drop of the fluid enters the larynx—it produces great irritation, and the spasmodic cough that ensues throws it out with great violence, perhaps even through the nostrils. The same accident happens from sucking up an egg, on the top of which some loose salt had been placed : the salt, during the act of inspiration, flies into the larynx, and I have known many persons almost reduced to the verge of death by an occurrence apparently so simple\*. Thus, in like manner, a bead, a shell, or any thing held incautiously in the mouth, will naturally follow the course of the air ; and, in the event of a full inspiration incautiously made, will certainly pass down into the trachea.

When it has obtained admission into the trachea, the symptoms it will give birth to must depend on its size, situation, its irritating qualities, whether sensible or chemical, and perhaps more particularly on the peculiar sensibilities of the surface to which it is applied. Mucous membranes, lining the passages by which substances are introduced into the body for its sustenance and support, and by which others are carried off, the presence of which would be pernicious, are endowed with different sensibilities in different parts, suitable to the action each has to perform. They bear the contact of those substances, however irritating, that are natural to them, without inconvenience ; but in any situation they ill endure the presence of a body truly foreign ; and the part is either thrown into violent actions in order to get rid of it, or inflammation, abscess, or ulceration, is the consequence. Of the entire extent of mucous surfaces, perhaps the larynx is endowed with the finest and most

\* In one instance I have heard of it producing fatal consequences.

acute sensibility : it is placed as an outwork to protect the important organ of respiration, and it rejects vehemently, and with spasmodic violence, every substance that can by possibility prove offensive or injurious. The lining membrane of the trachea and bronchiæ is far less sensible, and will endure the presence of a foreign body without more inconvenience than what its size occasions, provided its general qualities be not of an irritating nature. Thus, if the offending body be lodged in the larynx, the symptoms will be severe and almost incessant, and may within a few days cause the dissolution of the patient ; or if placed in a situation where it cannot materially interfere with the passage of the air, the membrane may, by constant contact, become accustomed to its presence, and the violent symptoms cease ; only, however, to be followed by those of ulceration, marasmus and hectic, and the patient, after protracted sufferings, perishes, with every indication of phthisis laryngea. On the contrary, when a foreign body has entered the trachea, and can move upwards and downwards with tolerable freedom, the first excitement occurs at the time of its entrance, and a violent cough ensues, after which the symptoms may exhibit great variety. Sometimes there may be a long and delusive interval of ease ; sometimes there is very considerable pain and suffering ; and, always, there is difficult or imperfect respiration, either by the mechanical occlusion of the bronchial tube, or through the effect of spasm. In this condition the patient may exist for some time, but sooner or later, if not relieved, the accident is always fatal.

A foreign body, then, may exist in the larynx or trachea under four different conditions :—

1st. It may be impacted in one of the ventricles of the larynx.

2dly. It may have passed through the rima glottidis, but, by reason of its lightness, may be moved upwards and downwards in the trachea. This is the most common form of the accident, for that body cannot be heavy which is acted on by the current of air which sucks it in.

3dly. Having entered the trachea, it may by its weight, by being entangled in mucus or any other cause, remain fixed in one of the bronchiæ, and give rise to a class of symptoms quite different from those attendant on the other accidents, but perhaps not less fatal.

4thly. It may have been introduced by accident from without, and remain in the spot into which it was first driven, as in the instance of the head of an arrow, or a pin.

When the foreign body is entangled in the larynx, the symptoms must vary in proportion to the degree of inconvenience it occasions, either by the mechanical interruption it creates to the passage of the air, or the local irritation produced by it, and perhaps in most instances by a combination of both these circumstances\*. The jaw-bone of a mackerel, entangled in the larynx, gave rise in the course of five days to symptoms that threatened immediate dissolution; whilst a man has retained a piece of gold in one of the ventricles for years without other inconvenience than the suppurations, &c. which any foreign substance would produce, and which ultimately proved fatal†. A good deal of the variation of symptoms will depend on the nature of the offending body, whether it be sharp and angular,

\* Pelletan.

† Paper by La Martiniere, in Mem. de l'Academie Royale.



or smooth, round and polished; and also whether from its size it shall be capable of interrupting the passage of the air. When the substance is sharp, such as a fish's bone, there is a severe pain experienced at the moment of the accident, accompanied with spasmodic cough and difficult respiration. The patient feels great distress, and points to the larynx as the seat of his uneasiness. After some time there is a deceitful calm, but the symptoms return with increased violence, accompanied with convulsions, and in the course of a few days death terminates the sufferings of the patient, unless he is relieved either by his own convulsive paroxysms of coughing, or by a surgical operation. It may happen, however, that if the body be round and polished and small, it shall create no symptom of distress except the cough and the difficulty of breathing, and the patient may exist for a long time without the occurrence of those morbid actions which render the accident certainly fatal.

In the course of the year 1805\*, a young man, aged twenty-four years, applied at the Hotel Dieu: he had been suffering during six weeks from severe cough, with frequent attacks of suffocation. His face at the time was swelled; his eyes prominent and sparkling; and if the paroxysm had lasted five minutes, he must have been in the greatest peril: but the symptoms abated a little, and he passed several hours without farther distress than the cough, and a constant rattling in his throat.

This young man said that he had put a button-mould in his mouth, which in a moment of hurry he thought he had swallowed, and that a violent cough followed instantly on the accident, and

\* Pelletan, Clinique Chirurgicale.

scarcely allowed him any repose. He further stated, that his greatest uneasiness was felt in the region of the larynx.

The patient being placed lying down on a bed, with his head drawn back, an incision was made through the integuments and cellular structure, between the sterno-hyoïdei muscles. The trachea was soon exposed, and, after the hæmorrhage had been stopped, some of its rings were divided. Instantly respiration was restored; the blood and mucus were expelled with facility, but the foreign body did not appear. The incision then was extended upwards through the cricoïd cartilage by means of a probe-pointed bistoury, when it presented itself, and was extracted from the left ventricle of the larynx in which it had been entangled. The patient stated that the extraction had caused him more pain than the incision through the parts.

In the evening the patient had some slight fever, and was bled, but soon recovered his state of quietude; and no unfavourable symptom again occurring, the wound was healed completely in the course of a month.

When a foreign body has passed the rima glottidis and entered the tube of the trachea, there is always in the first instance a violent cough, which continues for some time with great distress, and then subsides, leaving the patient in a weak and exhausted condition. This cough is generally renewed at irregular intervals, occurs in paroxysms of frightful violence, and is occasionally succeeded by a long and sonorous inspiration like whooping-cough; but this symptom is uncertain, for it has happened that it never returned, and its cessation, and the comparative tranquility\*

\* “Une tranquillité funeste fondée sur les intervalles de repos assez longs que l'enfant éprouvait.”—*Pelletan*.

the patient experiences, may lead both his friends and his medical attendant to a false and fatal security. The character of this cough is hard, harsh, and dry: the face is purple; the cheeks swollen; the eye protruded, and a stream of frothy saliva flows from the patient's mouth during his struggles. The respiration, however, is the function most carefully to be examined; it is always imperfect, but never (as far as I have observed) is it loud or stridulous as in acute cynanche trachealis. When the substance is loose, it is frequently, in its motions upwards and downward within the tube, heard to strike against its walls with a peculiar rattling sound\*. This is heard to most advantage when the patient makes a forced expiration, and the foreign body is driven up towards the larynx. When this is not perceived, the substance is probably at rest and lodged in the right bronchus†, through which it will prevent the transmission of air to a greater or less extent; there will then be a feebleness or perhaps a total absence of respiratory murmur in the right lung, although that side of the chest shall sound clearly on

\*Une râlement, signe caracteristique de la maladie.

† The circumstance of a foreign body constantly occupying this situation was first observed by Mr. Key, and has been accounted for in different ways; by the greater relative size of the right bronchus; by its angle with the trachea being more obtuse; and by the force of a supposed greater current of air passing to the right lung. Mr. Goodall, one of the demonstrators at the Park-street school, has offered a very ingenious explanation of the fact. He observed that the angle which marks the bifurcation of the trachea inferiorly is in a plane to the left of the centre of the body, so that a perpendicular line drawn from the rima will fall within the right bronchus. This explains why a sixpence or any similar substance introduced through the rima in a dead subject, where there is no respiration, and a current of air can have no influence, always takes the same direction, and is found in the situation described by Mr. Key.



percussion\*. This occlusion of the lung seldom lasts any continued length of time, and, when the foreign body changes its position, the air gains free admission, and respiration becomes equal in both lungs. When it is continued, that is, when the foreign body is impacted in the bronchus by its size, its weight, or by being entangled in mucus, the patient very often suffers the most intense distress and seems to approach the verge of suffocation; but of this he gradually becomes relieved, as if the system could accommodate itself to the diminished quantity of air. The absence of respiration in the right lung, and its sudden re-establishment, appears to be pathognomonic of the presence of a foreign body; at least I know of no other accident or disease that could occasion such phenomena.

There is always uneasiness and sometimes very acute pain, particularly when the foreign body is rough or jagged at its edges; this is referred to different situations, the inferior part of the larynx, the front of the neck, or deeply behind the sternoclavicular articulation. This symptom is, however, by no means uniform, neither is it proportioned to the apparent irritating nature of the foreign substance. In Mr. Houston's case†, in which a portion of a large molar tooth with its fangs entered the windpipe, the patient did not complain of more than "a feeling of undefinable uneasiness in the chest, a sensation of weight in breathing, and a tendency to draw heavy sighs, which kept his mind in a continued state of inquietude;" yet a more irregularly shaped substance can scarcely be conceived. Along with these

\* The stethoscopic indications of the presence of a foreign body in the trachea were first observed and pointed out in the Meath hospital, by my talented friend and colleague, Dr. Wm. Stokes.

† Dublin Hospital Reports, vol. 5.

symptoms, there is from the first moment an uncommon degree of restlessness, and, as occurs in every case of difficult respiration, there is great anxiety, the expression of which soon becomes distinctly marked in the countenance. Occasionally, there is an appearance of emphysema above the clavicles; but it is by no means a constant symptom\*, and I should suppose it to arise from a rupture of some of the air-vessels of the lungs, and therefore to be more or less accidental.

The progress of symptoms in these cases is so uncertain, that neither the period life may continue after the accident, nor the manner in which death will be produced, can be calculated on with any approach to correctness. Persons have dropped suddenly down and died immediately, probably from spasm of the glottis; or a rupture of some bloodvessel in the brain may be occasioned by the violence of the first fit of coughing. If the patient escapes these dangers, as probably he will, there is still a chance of the foreign body being thrown with violence during the cough into the rima, and there producing mechanical suffocation. This is more likely to happen within the first four or five days; for after that period inflammation will have been established, the lung and the bronchus loaded with mucus, and the motion of the foreign body within obstructed, if not prevented. At this period, if an operation is performed, the offending substance will probably be found in the right bronchus, and when detached and expelled is covered with bloody mucus; there will also be a copious discharge of this viscid fluid through the wound. If the case, however, is allowed to progress without surgical interference, death is certain to ensue, although at

\* I find this symptom to have been observed and described only in one case by M. Louis.

different periods after the accident, and under different pathological circumstances, sometimes from imperfect respiration the lung becomes congested and loaded, and the patient dies convulsed on account of the brain being supplied with an improper quality of blood; sometimes life is terminated by bronchitis, pneumonia, or pleuritis; and sometimes, at a still more remote period, death is preceded by symptoms of consumption. In proof of the degree of uncertainty that attends these cases, I need only notice that the subject of Mr. Houston's case died on the 11th day, after having suffered from every form of inflammation to which the parts within the chest are liable; whilst Mr. Liston's patient\* was operated on six months after a fragment of bone (a substance very analogous to a broken tooth) had passed into the trachea, and recovered in the most satisfactory manner.

In order to illustrate the preceding pathological remarks, I have selected from various sources the following cases, the first of which I have always regarded with peculiar interest, as bearing so strong a resemblance to that which I have already related as having fallen under my own observation:—

“A little girl†, four years old, whilst eating the kernels of apricots, happened to fall at the moment she had one in her mouth, and, as she thought, swallowed it. She was instantly seized with a convulsive cough which threatened suffocation. This after a short time subsided; but a difficulty of breathing remained, and the child said she felt a slight pain in the throat. The next morning she was visited by her medical attendant, and the following symptoms observed:—The acts of inspiration and

\* *Lancet*, 1833-4, vol. 2, p. 419.

† L'Escure.



expiration were performed with violent efforts; the air passing through the glottis caused a loud hissing sound; there was a swelling of the trachea below the larynx, alternating with the acts of respiration, and this was very apparent to the touch, particularly during expiration. The child swallowed with facility both solids and fluids, and there was but slight disturbance in the pulse; her voice was not at all changed; and the cough had not returned since the moment of the accident.

“At ten o'clock another practitioner was called to see her; he found her in a deep sleep, so as not to be awaked without difficulty. The same symptoms continued, but with some diminution; the pain in the throat had disappeared, and the child laughed, spoke, and ate as usual. She arose, walked about, and appeared tolerably well the entire day, exhibiting no symptom unless the hissing noise that was caused during respiration.

“The evening of the same day (twenty-four hours after the accident) respiration became more laborious; the pulse was agitated; deglutition difficult, without being painful; and the swelling of the trachea had increased. The child was in a state of agitation during the entire night following. Next morning her friends gave her a grain of tartarized antimony, and during the operation of the emetic the symptoms became aggravated almost to the point of suffocation. In the evening the child could only breathe with the greatest efforts; deglutition was almost impossible; the pulse small, weak, and very frequent; and she died about sixty hours after the accident. Her tone of voice had never changed, and the cough had never returned.

“On dissection, about half of the kernel was found immediately below the cricoid cartilage, of sufficiently small size to allow of its free motion upwards and downwards in the trachea.

“There was some little mucus in this tube ; the lungs were in many parts in a state of congestion, and emphysematous throughout their entire extent; but this latter symptom had not manifested itself externally, at least not so as to have been observed.”

It does not appear that the state of the brain had been at all examined.

In order that death should take place by direct suffocation, it is necessary that the size and shape of the extraneous body should be such as to allow of its being entangled in the rima glottidis, and held there, for otherwise a forced inspiration will throw it back into the trachea again, and for that time prevent the unfortunate event. But such is not the description of substances that persons are fond of holding carelessly in their mouths, or playing with incautiously. Amongst a great number of cases, I find a large proportion of these melancholy accidents to have been occasioned by French beans, or the stones of fruit which are rounded off, smooth and polished, and therefore cannot be so thrown against the rima as to be firmly held there, and cause an exclusion of the air. In such a case, life has not so quickly terminated, and the patient dies from the consequences of imperfect respiration ; the brain is gorged with dark-coloured blood ; the lungs in a state of congestion and emphysematous, and there is serous effusion into the bronchial cells.

A child of about five or six years old, into whose trachea a bean had fallen, was brought to Pelletan. It had during four

days suffered the severest symptoms of suffocation, and had been attacked with convulsions during the last thirty-six hours. A surgeon had attempted to perform bronchotomy, but cut no deeper than the skin, when he became frightened. Pelletan finished the operation; and scarcely was the trachea opened, when the bean was thrown out to more than two feet distance.

The child had been very weak, and, it was feared, might have died during the operation; however, by care and attention it revived, recovered its intellect, knew its parents, and seemed to be getting better: but at the end of eight or ten hours the convulsions returned, and it died fourteen hours after the operation.

*The excessive congestion of all the vessels of the brain*, which was observed on opening the body, had not prevented that remarkable relief which the child experienced on the removal of the foreign body.

A little girl six years old, whilst playing with her school-fellows, one of them threw a bean into her mouth, which unfortunately passed into the trachea\*. The child immediately was seized with cough, and complained to her mother that she had swallowed a bean. The alteration of her voice, which had become hoarse, and the difficulty of breathing which appeared instantly, determined the mother in seeking surgical assistance without delay. The patient pointed out the superior part of the trachea as the seat of her complaint; and this circumstance, together with the urgency of the symptoms and the account she gave of swallowing the bean, left no doubt as to the nature

\* Mem. de l'Acad. Royale.



of the accident. Verdier (who was the surgeon consulted) explained to the mother the miserable condition of the patient, and declared that he knew of no mode of saving her life unless by an operation, which would enable him to extract the foreign substance. Another surgeon thought proper to advise a trial of some of those remedies recommended on similar occasions, but the child grew worse under such treatment; she lost her voice, and was attacked with convulsions. The mother, now really frightened, consented to the operation, and Verdier got every thing in readiness. He sent for the assistance of a surgeon of eminence on whom he relied, in order to afford the child's friends every confidence in the measures he was about to adopt, but this last gentleman was also of an opposite opinion. A young physician who saw the case also declared against the operation, and it was abandoned. The child lived only three hours, deprived of sensibility, and dreadfully convulsed. Half an hour after its death, Verdier was permitted to operate; he made an incision along the trachea, and easily extracted the bean.

It does not appear that the brain was examined after death, but the condition of the patient, "deprived of sensibility and dreadfully convulsed," sufficiently explains the morbid actions that had taken place in that important organ; and had Verdier been allowed to operate in the latter instance, he would have discovered that it had been too late, and the child would only have obtained the benefit of a wretched existence prolonged for two or three days.

When a foreign body has fallen into the bronchus and remains there, the symptoms, in the first instance, will be those of diminished or obstructed respiration, the corresponding lung

being partially, or, perhaps, completely, deprived of air : the latter condition is that which has hitherto been most frequently observed, even in cases where the substance was not of sufficient size completely to fill the tube. The perfect occlusion of the tube has then, whether justly or otherwise been attributed to spasm; but, perhaps, in many instances a very small quantity of air may pass, yet the respiration be so feeble as to be inaudible externally. The distress occasioned by an obstructed bronchus is not equally intense in all patients, nor even in the same patient at all times : in some, it is not such as to create any great alarm, whilst in others, it seems to threaten immediate suffocation. It may be, that these intervals of ease are occasionally produced by the substance changing its position, or by the absence of spasm within the bronchus. The actual suffering is occasioned by the obstruction of the tube, and will not be relieved by opening the windpipe, or by any procedure short of the absolute removal of the foreign body. At a later period, when disease has been established in the adjacent structures, there must be a confusion of symptoms, that will render the stethoscopic indications less perfect and less satisfactory, and which will vary according to the pathological condition that may be predominant. In some instances, however, it is curious to remark how little the organs appear to suffer, and to what a length life may be prolonged under such disastrous circumstances. M. Sue relates a case of a girl who suffered from the rump-bone of a chicken occupying different situations in the respiratory tube during seventeen years, at the end of which time she coughed up the bone, but died eighteen months afterwards, with purulent expectorations, and other symptoms of hectic fever.

It is evident that foreign substances may gain admission into

the trachea by other means than passing through the natural opening of the rima glottidis. Wounds of the throat present an illustration of this species of accident, and particularly when they occur from gun-shot, by which parts of the clothing are often forced into the wound and left there, although the bullet makes its passage clearly out. The nature of this case will in general be pointed out by the particular symptoms, and it must be a rare occurrence that a foreign body should be forced through the neck, and into the trachea, without its presence being easily ascertained. However, such a case is possible, and the following relation will be useful in shewing what severe symptoms may arise from an apparently trivial cause, and what extreme difficulty may sometimes envelope the diagnosis of these accidents.

A child, aged nine or ten years, amusing himself with cracking a small whip, was suddenly seized with extreme difficulty of breathing, and soon exhibited all the symptoms of approaching suffocation\*. He complained by gesture of some impediment in the trachea. The surgeons who saw him, aware that he had never been left alone, and that he could not have put any thing into his mouth, did not suspect the existence of a foreign body impeding respiration. A copious bleeding appeared to be the most decisive remedy in a situation that was becoming every moment more threatening and more dangerous; but it produced no relief. In an hour after the accident La Martiniere was called to see him: he had then convulsive motions, and breathed very laboriously; his face was blue and swollen; his eyes starting, and his extremities cold; he had lost all sensation, and his death was momentarily expected. Those who

\* Paper by La Martiniere in the *Mem. de l'Acad. Royale*.



had previously seen the child had not neglected to examine the fauces, they had also passed an instrument into the œsophagus without making any discovery. On examining the neck externally, a small red spot, like the centre of a flea-bite, was perceived at its interior part, below the cricoid cartilage; and underneath this spot, at a great depth, could be perceived a kind of a little ganglion, circumscribed, of the size of a lentil, corresponding to the red mark, and of an unnatural shining appearance. The sensation could not be more distinct through the thickness of the parts. It was determined immediately to make an incision in the part; and the trachea being laid bare, a salient body was found, very small, and rising about a line beyond its convexity. This was laid hold of and extracted, and to the astonishment of all who witnessed the operation, a large brass pin was drawn forth, an inch and a half long, which had traversed the trachea from left to right, and even pierced its opposite wall. The child was cured in a few days; and it was subsequently discovered that this pin had been tied to the extremity of the lash of the child's whip, and that whilst he was cracking it, it had flown off, and buried itself thus deeply in the neck.

The sole indication for the relief of this formidable accident is to extract the foreign body by operation, when once its existence is clearly ascertained; and, above all things, not to lose time by waiting for the operation of stimulating medicines, administered with a view of exciting coughing or sneezing, and thereby facilitating its expulsion by the natural passage. There can be no doubt that some peculiarly favourable examples may be adduced to prove, that in some instances \* medicines of this

\* Hagendorn relates, that a girl eating plums swallowed a kernel, which unfortunately slipped into the trachea: this child in a moment

description have produced the desired effect, and that in some others the efforts of nature alone have succeeded in relieving the patient; but it seems to me to be a hazardous experiment to leave a patient struggling with cough and symptoms of suffocation for any length of time, in order to try what stimulating medicines may effect. Fabricius Hildanus objected to the use of this class of remedies on very reasonable grounds; namely, that the accident will of itself excite sufficient cough, without any necessity for the surgeon's interference. To this may be added, that a foreign body, once entered into the trachea, must require a number of favourable circumstances in order to be expelled again. It must be so small as to pass through the rima glottidis at a time when its size is much smaller \* than when it was admitted. It must be presented to the rima in exactly the same position it held at the time it entered; and it must be smooth and polished, so as not to be caught or entangled in the larynx. If to these be added, that very often the patient expires in a paroxysm of coughing, and if he does not, that he is driving the blood furiously to his brain, or that he is rupturing the air-cells of the

became in imminent danger of suffocation; her voice feeble and hoarse; sputa streaked with blood. They had immediate recourse to oily remedies, expectorants, and even emetics, but without success. At last they administered stimulants, which excited cough, and expelled the kernel from the windpipe.

Hevin mentions a case where a similar effect was produced by the operation of an emetic.

\* In endeavouring to repeat an experiment of M. Favier, which shall be detailed hereafter, I saw that the rima glottidis is dilated during a full inspiration; that it is smaller during expiration, and that when the animal coughed it became greatly contracted, so that the air was driven through it with considerable force. Hence, a kidney bean, or any other substance which might easily pass at one time, could never be expelled by cough when the rima becomes comparatively greatly reduced in size.

lungs, and producing emphysema in that important organ, few surgeons will be disposed to put much confidence in such remedies, when placed in comparison with a safe and easy operation.

As a mode of relief, in case of a foreign body finding its way into the trachea, Desault speaks of the introduction of an elastic tube through the nares into the windpipe; and he illustrates the advantages of this practice by relating the case of a child who was brought into his theatre in consequence of this accident. The operation was about to be performed, but on the first incision such a flow of blood took place that it was obliged to be delayed in order to command the hæmorrhage, and in the interval the patient died.

Whatever advantages this practice might have formerly seemed to offer, when the real nature of the results of this accident were but imperfectly understood, it is now evident not only that it is incapable of effecting a cure, but that it cannot even afford a temporary relief. Except when the foreign body is impacted in the larynx, there is no impediment to the free ingress of air; the rima is completely open, and consequently the introduction of a tube must be useless; but it is worse, and probably may prove decidedly injurious. I pass the consideration that this accident usually occurs to children; and that in persons under twelve or thirteen years of age the rima is so small, that the introduction of a tube would be nearly impossible; but it must also be recollected, that, if the foreign body is loose, it is liable at any moment to be thrown against or into the rima, and thus instantly to destroy the patient. What, then, is more likely to occasion this melancholy catastrophe than the cough which the irritation of a tube would inevitably



occasion? and again, what would be a surgeon's feelings if his patient died in his hands, and under the effects of an operation which he had promised would afford comfort and relief? When the offending substance occupies the bronchus, the distress is occasioned by the lung not receiving its supply of air; and nothing but its removal from that situation (which a tube will not effect) can possibly afford relief. I have seen a case in which tracheotomy was performed, and a very large aperture made in the windpipe: the foreign body was lodged in the bronchus, and the surgeon at the time unprovided with the proper instruments for its removal; and I never witnessed greater suffering, or a nearer approach to suffocation, than in this individual, until the extraction was completed several hours afterwards.

In this case, then, bronchotomy is not performed for the purpose of introducing air into the windpipe, but to facilitate the removal of an offending substance, the latter being the essential step of the operation. It becomes important, then, to consider the different situations and conditions in which it may be placed, and the methods of extraction that may be applicable to each. If it is entangled in the larynx, the difficulty will be met by making the incision pass upwards through part of this organ, and it will come into view and be easily extracted; and, indeed, it obviously becomes a general rule, that the incision for the removal of extraneous substances from the larynx and trachea must be much larger than when the operation is performed for any other object. Fortunately, this can, in general, be easily accomplished, even in young subjects, in whom in ordinary cases there is trouble or embarrassment from hæmorrhage; for the symptoms here are seldom so very urgent as to require the operation to be rapidly proceeded with, and the surgeon can

coolly and leisurely tie the vessels, or otherwise control the bleeding, before he opens the trachea.

Again, if the foreign body be loose and floating, the extraction is even more certain, and without any trouble to the operator; for it will be forced out by the air as soon as the aperture is sufficiently large to allow its passage. I have seen a plum-stone thrown with considerable violence to a distance of several yards from the table on which the patient was placed for operation. But the fact must be familiar to every practitioner that has seen bronchotomy performed, and witnessed the force with which the tube introduced into the windpipe is expelled on its first introduction, and the difficulty with which it is subsequently retained. It is completely established by the following experiment, performed by M. Favier, and related by M. Lescure in the *Memoirs of the Royal Academy of Surgery in Paris*.

A large dog was muzzled, and an incision made through the loose skin under the lower jaw, so as to allow of the tongue being drawn out through the wound; and by the operator watching the moment of inspiration, a piece of horseradish was pushed into the trachea. The animal instantly vomited; and respiration became so disordered that it was feared he would die instantaneously; however, after some minutes he appeared easier, although this tranquillity was of but short continuance. The symptoms were frequently renewed, and more particularly when he was subjected to any motion.

In six hours afterwards, bronchotomy was performed; and scarcely had the bistoury been withdrawn, when a strong expiration forcibly expelled the foreign substance through the wound. It was again replaced, and again thrown out. It was

pushed even down into one of the bronchiæ, and the result was still the same. And after this had been repeated ten times, the poor brute was released, his wounds dressed, and at the end of three weeks he had completely recovered.

Some time afterwards, the experiment was repeated in a more public manner, and it was found that substances of every kind and of every shape introduced into the trachea of living dogs were forcibly expelled after the operation, no matter whether the animal was lying down or standing up, or under what circumstances the experiment was performed.

It has been already stated, that a foreign body may be fixed and stationary within the right bronchus under two several conditions: it may be retained there by the effects of spasm, or by being entangled in mucus, but still be capable of expulsion if the corresponding lung is filled with air; or it may, by its weight or its shape, be incapable of removal by any act of forcible expiration whatever. To the practitioner it is of the utmost importance to be aware of these conditions; for in the former case, if the substance can be disturbed from its position by the introduction of a long probe, and the air thus permitted to pass by it into the lung, the next expiration will probably throw it out through the wound, whereas in the latter it must be mechanically lifted up and removed, a proceeding that is attended with great difficulty to the surgeon, and a horrible sense of suffocation to the patient. Before proceeding to the operation, therefore, it will be desirable, if possible, to ascertain the nature of the foreign body, its size, shape, and probable weight; and, above all, whether there had been any stethoscopic indications of its having ever changed its place since the time of its introduction. Fortunately, the class of



substances thus accidentally passed into the trachea is such as can be easily acted on by a column of air; indeed, it is thus they are generally introduced, and are therefore capable of expulsion by a similar force. I say, fortunately, for I cannot well conceive a more difficult or embarrassing process than their removal by means of mechanical instruments.

It must be acknowledged, that in the dead subject nothing is accomplished with more facility than the introduction of a pair of forceps, adapted to the purpose, and the removal thereby of any thing that had been dropped into the bronchus; and also, that in Mr. Liston's case, the extraction was effected with much less difficulty and danger than could have been anticipated: yet I would warn the younger class of practitioners not to build upon these facts with too much confidence. The subjects of our operations, in the great majority of instances, are children: their tracheæ are too small for the introduction of instruments, or the necessary manipulations afterwards; and their restlessness and struggles will in themselves create an almost insuperable difficulty. Even in the adult, where these objections do not exist with equal force, the operation is not so easy. The surgeon must be provided with a number of pairs of forceps of different lengths, for the instrument by which the extraction is made must be so contrived that its blades shall seize the foreign body, whilst the hinge that connects them occupies the spot at which the trachea has been opened. It will be advisable, before proceeding to the extraction, always to introduce a probe, in order to ascertain the precise situation of the foreign body, and its depth from the external wound: the proper forceps may then be selected, and the operation completed at once. A want of dexterity, exhibited in successive introductions of an instrument and failures to grasp the offending substance, is worse

than unseemly on the part of the surgeon, for it adds greatly to the sufferings of the patient, and in no small degree to his danger also. When the circumstances of the foreign body are such that it can be expelled without the employment of instruments, it will be only necessary, in performing the operation, to make a long slit-like incision into the trachea: in the other case, a large portion should be cut from the front of the tube, in order to allow the hinge of the forceps to play with freedom.

### CASE.

James Bryan, æt. five, a healthy robust boy, was brought to Mr. Smyly's residence by his mother, who stated, that half an hour previously he had been seized with a violent convulsive cough, which had continued without intermission until they arrived at the door. No information could be obtained as to the cause, except from the child, who said that he had swallowed something he found in the street; that it had stuck in his throat, and that the cough came on in consequence. His face was red, swollen, and covered with perspiration from the violent efforts he had made; his eyes suffused and filled with tears, respiration hurried; he spoke without difficulty or pain; and when desired to cough, he did so with a hoarse sound.

On applying the stethoscope, the most intense puerile respiration was heard throughout the left lung: through the right it was scarcely audible.

Both sides of the chest were equally clear on percussion.

The nature of the case was then explained to his mother, who at once consented to allow the operation to be performed, which was immediately proceeded with, in the Meath hospital, by Mr. Smyly, assisted by Mr. Collis and myself. On the trachea being opened, violent fits of coughing took place, and succeeded each other with great rapidity. Several attempts were made with a long forceps to dislodge the foreign body, but without success; the instrument was too thick, and its presence in the trachea caused the most intense distress: a probe was tried, but was not sufficiently long to reach it. These efforts occasioned cough, with great irritation, which obliged us to desist. The patient was then placed in bed, a silver canula having been introduced to keep the wound open.

He fell asleep shortly after getting into bed, and seemed to be tranquil; but in the course of the night his breathing became very difficult. At six o'clock in the morning his state was very distressing. He experienced great difficulty of breathing; respirations 56; countenance anxious; face and lips livid; pulse 160; a loud mucous râle was heard in the left side, but no sound whatever in the right.

At half-past nine A.M. he lay in an apparently moribund condition; heavy, almost comatose; face bloated and livid, mucous ronchus in the trachea: a long gun-shot probe was now procured, and passed down, by which the foreign body was disturbed, and a violent fit of coughing excited. A kidney-bean was then expelled, followed by a large quantity of ropy mucus; immediately after which respiration returned in the right lung, and was heard peculiarly loud in it for some hours. After a little time the wound was closed, the patient composed to sleep,



and on awaking appeared wonderfully relieved: respirations had fallen to 27, pulse 84.

This case pursued a favourable course. There was a good deal of bronchitis, which was treated with calomel and hippo, and by the application of a blister between the shoulders. On the eleventh day the wound might be considered healed, as no air passed through it when the child cried, and in a few days afterwards he left the hospital in perfect health, and with the use of his vocal powers unimpaired.

## BRONCHOTOMY AS APPLICABLE TO THE TREATMENT OF ASPHYXIA.

Importance of the subject—Division into three Classes—Asphyxia from a Morsel resting on the Epiglottis—Cases—Pathology—Treatment—Asphyxia from Spasm of the Glottis—Case—Experiment—Treatment—Asphyxia by Drowning—From Breathing an Impure Air—Pathology—Treatment—Asphyxia from Hanging—Cases—Experiment—Remarks on the Operation of Bronchotomy.

IF there is an accident which, in a peculiar degree, more than others requires prompt attention, it is that of suspended animation; and therefore is it one which should be thoroughly understood in all its branches and varieties, and on which every practitioner should have settled and determined principles to govern his conduct. When a man falls down apparently dead, deprived of motion and no longer breathing, or when he is drawn from the water in a state of insensibility, there is no time for deliberation, for consulting authorities, or seeking far-

ther professional assistance: one single minute may decide the sufferer's fate for ever; and on the manner in which it is employed, the happiness or misery of families may depend. I will not dwell on the professional reputation that may be lost or won on such an occasion, although this is a consideration which should have due weight with every practitioner; but if there is a case in which success more than repays exertion, by the inward gratification it imparts, it is the restoration of a fellow-creature to life and its enjoyments. For a contingency of this description, a man must be always prepared; he must have his resources ready to be brought into operation on the most sudden emergency; for these accidents are almost constantly attended with hurry and confusion, in which, if the surgeon participates in the smallest degree, his patient will probably be lost. Calmness and self-possession are absolutely requisite; and the only means by which they can be acquired, is by studying and becoming familiar with the different forms of asphyxia, the causes that produce them, and the possible complications, both favourable and otherwise, that may be present in each: thence may the proper line of treatment be deduced, and principles established that can be applied without hesitation or delay.

The physiology of asphyxia has of late years been so amply discussed, particularly in Dr. Kay's admirable work, that it may, on the present occasion, be passed over without observation: with the treatment, however, I am not so entirely satisfied, and especially with respect to the operation of bronchotomy. I fear this part of the subject has not been considered practically; and hence the opinions hitherto delivered on it are (to say the least) too sweeping, and too universally applied. In looking at the few authorities I have been enabled to consult, I find the

operation condemned in no qualified or measured terms—declared to be barbarous, unprofessional, and unworthy of the surgical practitioner. It is stated by some, that the inflation of the lungs may be as easily effected by the introduction of the nozzle of a bellows into one nostril while the other is closed, and the larynx pressed back against the spine; and, by others, by the passage of an elastic tube through the glottis, an operation which is spoken of as being of great facility. At the present day, perhaps, it may be hazardous even to appear to advocate a mode of treatment thus decried: but having seen a good number of cases of suspended animation, and observed that the efforts to resuscitate were generally unsuccessful, I have given my best attention to the subject, and the result has been the adoption of an opinion not exactly coinciding with that detailed above.

Independently of the asphyxia of new-born infants, which it is not my intention to allude to here, I think the cases of suspended animation most commonly met with may, with a view to their treatment, be advantageously divided into three classes: 1. Where the patient suffers from a deprivation of air, in consequence of the glottis being closed, the lungs remaining perfectly healthy, and capable of performing their functions if air was admitted: as, for example, in cases where sudden death occurs whilst the patient is eating, and in all cases of spasm of the glottis, whether idiopathic or induced by perfect submersion in carbonic acid gas. These are examples of the most rapidly-formed asphyxia, death being produced quite suddenly, or within the space of a minute. 2. Where the glottis remains open, but the lungs, nevertheless, are either deprived of air, or offered that which is unsuited to the maintenance of life: drowning presents an example of the one, and persons sleeping by a lime-



kiln, or in a chamber with a chafing-dish of charcoal, offer familiar and frequent illustrations of the other. In some few of these cases the lungs may possibly be healthy; but, in general, they and the vessels at the right side of the heart are gorged and loaded with dark-coloured blood; the pathological condition being very much influenced by the length of time that elapses before the asphyxia becomes complete. 3. Where, besides the exclusion of the air, there is an abnormal condition of some other part or viscus produced, as of the brain, in cases of death by hanging: these are not cases of pure asphyxia, for the complication is usually the most serious and irremediable part of the accident.

1. When death occurs during the process of deglutition, it is from hastily attempting to swallow morsels either of too large dimensions or imperfectly masticated, which, in the effort, happen to become so placed as to lie exactly on the epiglottis, shut it down completely, and, of course, destroy the patient almost instantaneously.

A ravenous servant\*, in removing a dish of which he is particularly fond, attempts to devour a part of it before he reaches the kitchen: he makes two or three convulsive efforts to swallow, and perhaps the first notice the people in the house receive of the accident is by the man tumbling down stairs, ap-

\* Mr. Crampton (the present Surgeon General) used in his lectures to relate a case in which he performed bronchotomy with the most complete success, the circumstances of which very nearly resembled this. Indeed, as well as I can recollect after an interval of several years, the above is an exact outline of the case, and exhibits a specimen of the decision that may be necessary in the treatment of symptoms so exceedingly obscure.

parently dead. When taken up, his eyes appear fixed and protruded, his lips swollen, and his countenance purple and livid: there is no pulse to be felt at the wrist, and all the circumstances would lead an inexperienced practitioner to believe that the man had fallen in a fit of apoplexy, and died. If the mouth and fauces be examined, they will produce no discovery, for the morsel lies below the base of the tongue, and cannot be seen. If a probang be passed into the œsophagus, it will meet with no impediment, for it will pass backwards towards the spine, and glide over the morsel. Here, then, the epiglottis is firmly and suddenly compressed, the air is entirely excluded, and if the case be mistaken, or if, from any other cause, the patient be not very speedily relieved, he must inevitably perish. If, however, bronchotomy be performed with a view to inflate the lungs, the first breath of air will force up the epiglottis, and throw the morsel which caused all this mischief into the mouth, from which it may be easily removed by the fingers.

A woman passing along the street, and eating a piece of cake, suddenly fell, gave two or three convulsive struggles, and to all appearance died. She was taken up, and surgical aid almost instantly obtained; the fauces were examined without any appearance of an extraneous body; an elastic switch was passed down into the œsophagus, and as far as the stomach, without meeting with any impediment. Bronchotomy was proposed, but, in consequence of some objection being raised, it was not performed, and the patient was lost. On dissection it was found that this woman had a deficiency in the palate, which was stuffed with rags of lint: these had gotten loose, and became entangled in the morsel she was about to swallow, which was stopped immediately over the epiglottis, and thus kept it closely shut down.

I had, not long since, an opportunity of satisfactorily ascertaining by dissection the exact position of the morsel in these cases of sudden death, which I most gladly availed myself of, as the opinions I entertained on this subject were derived rather from the symptoms produced than from actual observation.

In the month of February 1834, I was requested by the proper authority to examine the body of a sailor, who, it was stated, had come by his death under circumstances of suspected violence. He had been eating in company with another man in an upper room in a public-house: both stood up and walked to the stairs, down which one of them fell or was thrown, and was taken up at the bottom of the flight quite dead. The body was that of a low-sized stout man, with a remarkably short neck; the face was swollen and very red; the eye-balls staring; and every external appearance denoted that he had died by apoplexy, particularly as no mark of injury could be detected. On examining the mouth, I observed a remnant of some potatoes and meat still lying on the tongue and adhering to the teeth: the idea then immediately occurred to me that this was an instance of death by imperfect deglutition. I therefore dissected the parts with great care, and found a large piece of half-chewed boiled mutton lying exactly on the epiglottis, and effectually shutting it down.

This view of the pathology of the accident suggests at once the mode of practice that will be successful. If the patient is yet struggling with the morsel, all that can be necessary will be to free the epiglottis from the unnatural pressure, and this will be easily effected if its situation be borne in mind. If the patient is apparently dead, the case is still more urgent, and bronchotomy must be performed, the lungs inflated, the requi-



site treatment for suspended animation adopted; and unless time, which is here most valuable, be unaccountably trifled away, the surgeon, in all probability, will be rewarded by the most gratifying result.

But, if it be ascertained that the morsel always rests upon the epiglottis, it may be asked why it should not be removed by the finger or the forceps, and the common means of restoring suspended animation subsequently resorted to without having recourse to the knife at all? The answer must depend on the manual dexterity of the practitioner, and on his acquaintance with the nature of the accident. If he can remove the morsel from its situation, and introduce a tube through the natural passage in less time than he could accomplish the introduction of air into the lungs through an artificial opening, of course he should prefer that mode of proceeding by which least time was lost\*. But the question is, will the young practi-

\* A very dangerous opinion exists, even amongst medical men, that persons in a state of suspended animation may be restored after a very considerable lapse of time; and this mistake is kept alive and fostered by reports from Humane Societies, &c., in which wonderful stories are related of resuscitation after a most incredible space of time. So far as these stories may induce practitioners to undertake cases apparently desperate, and to labour patiently and diligently for their recovery, they can do no harm; but the moment they are adduced as reasons why the least possible delay can be admitted, they are most injurious, and may prove the occasion of loss of life. It is impossible to say at what precise time after apparent death the action of the heart ceases, or, at least, that it is no longer capable of being re-excited: perhaps much may depend on individual idiosyncrasy, and that differences may exist in different persons; but certainly that practitioner will act most securely, and have most success, who allows the least time to elapse between apparent death and the commencement of his attempts at resuscitation.

tioner, called, perhaps, for the first time to such an accident, in the hurry of the moment, and surrounded by a crowd of anxious and agitated spectators, be equally competent to the completion of these tedious and difficult manœuvres as to the performance of a safe and easy operation? Let any man make a section of the fauces, and examine the situation which such an extraneous body would occupy placed behind the root of the tongue, and he will see that its removal may prove both difficult and tedious. And supposing the obstruction removed, the lungs must be inflated, and artificial respiration maintained, which never can be accomplished with so much ease as by creating a direct passage by means of bronchotomy\*.

There is another circumstance connected with this subject which should decide the surgeon in favour of bronchotomy. It is well known that the powers of life in any patient that has been apparently suffocated are extremely reduced, and that after his restoration it frequently requires the utmost care to prevent his relapsing into his former state again. Thus, it may happen that the process of inflation of the lungs shall have to be resumed five or six times, or even oftener, and this during a very short space of time. If such necessity should be found to exist, there are, probably, few practitioners who would prefer the introduction of a tube through the nostril every time respira-

\* Desault would, in such a case, recommend an elastic tube to be passed into the trachea, and instances a case in which it might have been successfully used: "*une femme avala un os avec tant de voracité qu'il resta dans le milieu du pharynx. A l'instant même tous les signes de la suffocation survinrent, et au bout de trois minutes la malade n'existoit plus.*" Does not the place where this bone was found, "*le milieu du pharynx,*" and the circumstance of its so immediately causing death, shew that it was pressing down the epiglottis?—and if it was so, how could a tube be introduced into the larynx?

tion became imperfect; and as for leaving the tube, once introduced, within the trachea, producing irritation and exciting cough, it would scarcely be feasible, and certainly injudicious. On the other hand, the operation of bronchotomy presents the easiest means of inflating the lungs at any moment, and although the necessity of resorting to this procedure may possibly not arise, yet the operator should always bear in mind that in all probability it will, and prepare in the commencement for those contingencies which may subsequently create no inconsiderable embarrassment, or perhaps render all his exertions unavailing.

It has been supposed that the stoppage of a foreign body lower down in the œsophagus, might, either by direct pressure on the trachea or by inducing spasm of the glottis, create such a difficulty of respiration as to render an operation necessary. Certainly this accident does occasion severe distress, and gives rise to alarming symptoms; but they are not of a character that indicates immediate danger of suffocation, and can never require bronchotomy. A man suffering from such an accident, will have a forced and almost an incessant cough: there will be straining to vomit; a copious flow of saliva from the mouth; his face will appear red and swollen from the constant exertions he makes to free himself from his uneasy situation: his eyes will be protruded, and there will be considerable anxiety depicted on his countenance; but there will be no difficulty of breathing beyond what must be occasioned by the absolute pressure on the posterior membranous part of the trachea.

There is scarcely any substance sufficiently small to pass into the œsophagus below the situation of the epiglottis that will not be capable of being forced into the stomach, unless it



be sharp or pointed, or accompanied by some other untoward circumstance which will cause it to wound the œsophagus and stick firmly in it; and in such a case I would prefer cutting into this latter part, and extracting the offending substance, to any other operation whatever. If bronchotomy was performed for the relief of such an accident, it must be below that part of the œsophagus in which the foreign body is situated: and if we take into consideration the size of any substance sufficient to press severely on the membranous part of the trachea, and the situation such substance must occupy, it is evident that any operation to remove the inconvenience must be performed at the very root of the neck, where the trachea lies deep, and where very important parts may be endangered. And next, after relieving the urgent symptoms, the difficulty of getting rid of the original cause of the mischief remains as great as ever; so that, under any view of the case, the operation will probably not be advisable for the relief of this particular species of accident.

At the same time, I am aware that there are high authorities amongst the records of surgery to warrant a very different opinion. One of the first of these, and probably that one to which the greatest importance has been attached, is that detailed by Habicot\*; but this is, probably, not a fair specimen of the

\*“Un garçon de la campagne, âgé de quatorze ans ou environ, avoit oui dire que l’or avalé ne faisoit aucun mal. Ayant vendu quelque marchandise à Paris, dont il avoit reçu quelques neuf pistoles; de peur de voleurs les empaquetta dedans une linge qui l’avalâ. Mais ne pouvant passer le detroit du pharynx, ou gosier, la face lui devint si epouvantable et difformè, pour l’enflure et noirceur d’icelle, que ceux qui l’accompagnoient le mécoignoisoient: de sorte que l’apportant chez moi, ne pouvant lui faire devaller, ni attirer un tel obstacle dedans l’estomac, tant il étoit serré par l’enflure de la gorge; considerant qu’il etouffoit, apres un bon

accident immediately under consideration ; for it appears the foreign body stopped somewhere very high up in the throat, probably so high as in some measure to press upon the epiglottis ; and at all events, as it was subsequently forced into the stomach, there seems to be no sufficient reason why this was not done first, and the pain and inconvenience of the operation spared altogether.

I believe an examination of most of the other cases in which mention is made of the necessity of this operation will be found to exhibit nearly similar circumstances.

Spasm of the glottis may be produced by a variety of causes : it is, as has been stated, idiopathic in the child ; it occurs very frequently to the hysteric female, though not to the extent of inducing suffocation ; it is liable to happen in all forms of laryngeal disease, and very often proves fatal ; it may arise from the accidental admission of a foreign body, such as a particle of salt, into the larynx ; and it is the manner in which a perfect submersion in carbonic acid gas destroys life. The cases of suspended animation from this cause ought to be in general favourable for attempting resuscitation, because the lungs are not necessarily engaged, that is, a diseased or congested condition of the lung forms no part of the cause of the asphyxia ; yet, prognostic, je lui fis la broncotomie ; laquelle etant faite, il ralloit si impetueusement de la violence de l'air, que cela épouvantoit ceux qui etoient autour de lui : mais la tumeur et mauvaise couleur de la face s'étant evanouiés, les assura de la vie et nommément apres que j'eus derechef introduit la sonde de plomb (dans l'esophage) pour achever de devaller dans le dit estomac ce tampon, lequel huit ou dix jours apres le rendit par le siege, a diverses fois et son or ne fut perdu, ne si avanturè ge sa vie, qui lui fut restituée par la plaie de la trachée artere de laquelle il reçut prompte guérison.

are they not the cases in which the effort is most frequently crowned with success? Even in experimenting on animals, I have never seen an instance of recovery after perfect immersion in pure carbonic acid gas.

It is assumed, then, that the lungs are healthy, and that the species of asphyxia under consideration has been occasioned by the exclusion of the air, in consequence of the spasmodic closure of the glottis. The next point to be ascertained is the duration of that spasm after life appears to be extinct. This is a question of some importance, with respect to the facility of performing insufflation; and I believe the opinion generally entertained, that the spasm ceases with life, is not borne out by facts; indeed, it might be inferred that this does not speedily become relaxed, from the circumstance of the bodies of persons that die of laryngeal disease becoming extremely rigid, and remaining so for an unusual length of time. The following observations may throw some little light on the subject.

A patient in one of the medical wards of the Meath hospital, suffering from laryngeal disease, dropped suddenly dead whilst drinking a little milk about nine o'clock on the morning of the 10th February 1836. The body was examined after an interval of two hours and a half, and the upper part of the larynx found to be the seat of extensive ulceration; the rima glottidis was completely and rather firmly closed. On the next morning, or about twenty-four hours after death, it had become nearly as large as it ought naturally to be.

In prosecuting some experiments on this subject, a stout middle-sized dog was let down into a brewing vat, that had been emptied of the fermenting liquor about ten minutes previously;



he was, to all appearance, perfectly dead in two minutes. After allowing the body to remain thus for twenty minutes, it was examined; the glottis was found to be of a very pale colour, and the rima completely shut up by the close approximation of the arytenoid cartilages. The epiglottis was shut down like a lid upon a box, so as perfectly to close the superior aperture of the larynx: this latter was a curious appearance, and I know not what muscles could produce the effect; but the fact was witnessed by Dr. Hart, Dr. Young, and others.

Under circumstances of this description, it is evident that any attempt to inflate the lungs by the introduction of the nozzle of a bellows into the patient's nostril would be unavailing, for, whilst the spasm of the glottis continued, not a particle of air could pass. Thus have I seen, in more than one instance of suspended animation from carbonic acid, an operator inflate the stomach and the whole intestinal canal to an enormous size, whilst he thought the air was passing into the lungs, never once considering or being aware that it was perfectly excluded by the condition of the glottis. In such a case, it certainly is possible to pass a tube through the rima, by seizing the tongue and drawing it forwards whilst the larynx is pushed back against the spine; but unless to a person who had acquired dexterity by practice, even this will be attended with difficulty and delay, and, besides, will require more force than an inexperienced practitioner will be willing to exert. Under all circumstances, the surgeon who would, in these cases, resort to bronchotomy at once, would probably prove most successful.

2. The bodies of persons that have suffered death by drowning always exhibit a congested state of the lungs and of the vessels at the right side of the heart; but in these respects there

is some variety according to the length of time the patient had struggled in the water, before he had become asphyxiated, those who appear to perish quickly exhibiting the least pulmonary derangement. Sometimes the lungs contain a small quantity of water, and in other cases there is only a frothy mucous fluid. The vessels of the brain are not more gorged than usual, and the irritability of the heart remains for some time.

When persons die from respiring an atmosphere strongly tainted with carbonic acid gas, the appearances are somewhat similar, except that the lungs are even more loaded, and exhibit large spots or patches of a deep purple or black colour; the right side of the heart is full of blood, and the irritability of the organ is more impaired, and sooner altogether lost than in the former case. In one instance of death, from sleeping in a room with burning charcoal, I found the vessels of the head and face loaded, and the veins of the neck turgid and prominent under the finger. In both these accidents, which are unfortunately but too frequent, the rima remains open.

In discussing the mode of inflating the lungs in these cases, it would be absurd to mention bronchotomy if the practitioner who happens to be present or first sees the patient is provided with the proper instruments for the treatment of suspended animation. But if he is not, the question to be decided is, how are the lungs to be inflated with the least possible delay? In the great majority of instances wherein respiration has been completely suspended, actual death ensues in from three to five minutes; at least in our experiments we seldom see the animal recover after that period, and thence the importance of even a few seconds may be easily inferred. Now, if a surgeon happens to see a body drawn from a canal, in which it had been some

minutes submerged, is he to order that body to be carried to the nearest institution at which an apparatus for the recovery of the drowned is kept, or is he to open the windpipe on the spot, and commence insufflation with his own breath at once? The adoption of other useful or necessary measures, such as the application of warmth to the surface &c., for want of attention, to which a patient is very often lost, may not be easily provided for in a boat, or on the bank of a river; but with reference to the inflation of the lungs alone, there ought to be little hesitation as to the means to be adopted. With some caution, an opening into the trachea of an asphyxiated person may be made safely and rapidly; the air blown from the lung of the operator himself will, as I have frequently proved, be sufficiently pure, and perhaps the warmth with which it is impregnated may, in some respects, prove beneficial.

On this subject, it is essential to establish some fixed rule and principle of action. If a person is drowned in the immediate neighbourhood of an institution where a suitable apparatus is kept, or if he can be conveyed to it without a perilous loss of time, bronchotomy would be totally uncalled for; or if the practitioner who first sees the case happens to have about his person any tubes, or other instruments that can facilitate the inflation of the lung without making a direct opening into the trachea, most assuredly no one ought to object to their employment. But such fortunate coincidents do not occur in practice. The accident under consideration allows no selection of attendants, it must be treated by the practitioner who chances to be nearest to the spot, or not at all; nay, it is a happy occurrence if any can be had within the required time. If the patient is to be preserved, it must be by quickness and decision; and I think it would be a matter of reproach to a surgeon to delay the inflation



of the lungs by means of bronchotomy, in order to wait for more perfect instruments, and perform a bloodless operation.

The person who has fallen asleep by a lime kiln, and thus breathed an atmosphere impregnated with carbonic acid gas, is somewhat differently circumstanced, although the appearances on dissection may, to a certain extent, agree. In this case, a perfect state of asphyxia is produced more slowly, and the lung is not only congested with dark blood, but its cells filled with an impure and poisonous air. Thus it becomes more than questionable, whether air that had been respired would be sufficiently pure for insufflation; an argument which, if true, is decisive against bronchotomy, the chief value of which is, that it allows the operator himself to inflate the lung without a moment's delay. Whether from either of these causes, or from some poisonous quality in the gas itself (for there is reason to believe its application even to the external surface of the body, is deleterious), or from the combined operation of all three, certain it is, that when the asphyxia is complete, and no sign of animation remains, recovery is extremely improbable. In the earlier stages, and while yet there is respiration, however laboured and imperfect, a good deal may be effected by a full abstraction of blood, the removal of the patient into a pure atmosphere, the application of cold water to the surface, and the use of stimulants; by these or similar measures I have seen many recovered from a most perilous condition, but never from the more advanced stage, when animation was completely suspended. I do not, however, by any means intend to advance, that recovery is impossible, or that the utmost diligence and perseverance ought not to be employed in this as in every other form of asphyxia; but writing from experience, I merely state the result of my own observation, without adverting to opinions that have been entertained by

others. I would, myself, lend my best exertions to the relief of such a case, but without encouraging very sanguine expectations of success.

3. In cases of asphyxia, caused by suspension, the question of bronchotomy may be still more easily disposed of. These cases are divisible into two classes, essentially different in all their circumstances; those which suffer in this way as a mode of punishment; and those who inflict it on themselves with a view to suicide, or are strangled accidentally. Medical jurists have entered largely into the discussion of this subject, principally with a view to determine the means of recognising the different cases; but that is foreign to our inquiry, for the “suppliciès” are (at least in this country) placed far beyond the possibility of recovery, even if such an improper and unwarrantable attempt should be undertaken. We have, therefore, only to deal with the suicide, or the person accidentally hanged; and I imagine so far as the mere suspension of animation is concerned, these cases must resemble those produced by drowning, and the observations made on that subject ought to be applicable here; but it has been already stated, that these are not cases of pure asphyxia; they are complicated; and the complication is too often the most irremediable part of the accident.

I can well recollect the instance of a young man, a friend of my own, who hung himself in a fit of despondency from some disappointment in a love affair. He was discovered in a few minutes, and cut down while still breathing; but it was of little avail, for he never spoke afterwards, and died on the ensuing day. The body was examined after death, and no satisfactory explanation given of its cause, except that the vessels of the brain were congested. There was only a trifling ecchymosis of

the neck, marking the situation where the cord had been applied.

A boy, in the service of a brewer, thought to vex his master, by whom he imagined he had been treated with severity, by hanging himself, and accordingly put his plan into execution. He was discovered, cut down, and brought to the Meath hospital, where he was placed under my care. He was at first quite stupid, with stertorous breathing, and incessant jactitation; he answered no question, and seemed impatient and angry at being disturbed; in short, he resembled a patient with the incipient symptoms of compression on the brain. He was bled largely from the jugular vein, and seemed, in some respects, to be relieved. Leeches were applied to the temples, he was cupped on the back of the neck, and the whole head shaved and covered with a blister: every thing that could be devised was done for him during the six days he lived, but in vain; he never recovered consciousness, or spoke a word afterwards. Dissection shewed no more than a vascular and congested condition of the brain.

It is quite unnecessary to dwell longer on this subject, when it is recollected that an opening made into the windpipe, previous to suspension, will not preserve life. Encouraged by the experiment of Hunter, I bronchotomized a dog, and hanged him afterwards for two hours: the poor animal struggled, and was taken down alive; and never did I more regret the barbarity of an experiment which, after all, turned out to be valueless, as he died in two days afterwards. The case of the butcher Gordon, which is quoted in the *Memoires de l'Academie Royale*, and all the works on juridical medicine, is still more apt: he was bronchotomized previous to execution, and though taken down alive, he derived no benefit from the operation. After having been re-



moved to bed, and while his attendant was making efforts to restore him, he had two or three convulsions, and died in a few minutes afterwards. All these cases prove that there is something more than asphyxia caused by hanging, and that the remedies which may be useful in the simple case of suspended animation cannot, unless under singularly fortunate and fortuitous circumstances, be expected to prove as salutary in this.

In the preceding observations I have only noticed the forms of asphyxia that most commonly occur, and with which the surgeon will be most frequently called to deal; and it may be seen that I have merely directed my attention to the subject of bronchotomy as an auxiliary measure in such cases. Thus, I have considered asphyxia as a kind of intermediate state between life and death, which without active measures will certainly terminate in the latter, but from which restoration is possible; and the circumstances that interfere to prevent such restoration are, the length of time that has elapsed since animation became suspended, and the organic changes produced by the causes that led to the suspension. The time that a body may remain asphyxiated is not known, but is probably very short; and hence I have only advocated the operation in cases where it appears to offer the sole or the speediest means of inflating the lungs. I may now shortly advert to the chief practical objection that has been advanced against it; namely, the danger of hæmorrhage into the trachea, and the consequent suffocation of the patient.

In the living subject, although hæmorrhage of this kind is by no means an infrequent occurrence, and from the struggles it occasions has rather an alarming appearance, yet, I have never known it to produce really dangerous results, the blood being

coughed up and expelled by the efforts of the patient alone. But while the subject is not breathing, any blood that flows into the windpipe will remain there, and if in quantity must occasion serious consequences. With respect to this observation it may be answered, that the awkward performance of an operation, or the selection of an improper locality, cannot fairly be adduced as an argument against it; and this, if properly and judiciously performed, ought not to cause the loss of a teaspoon-full of blood. All that is required is an opening into the trachea in any part below the rima, and the crico-thyroidean space is obviously the situation to select, for there the tube is superficial, most easily reached, and there is no important bloodvessel in the way. I cannot imagine the smallest difficulty or danger in the performance of this operation. On the other hand, I have seen the windpipe opened lower down in the neck: the first incision caused a great flow of blood; but it ceased almost immediately, and the operation was finished without any delay worth noticing. The case was unsuccessful, and the breathing never renewed; but had it been otherwise, I know not what might have been the result after respiration had been re-established, probably the hæmorrhage might have recurred, and occasioned a vast deal of present inconvenience and ultimate danger.

It is scarcely necessary to observe, that with a bronchotomy trochar the windpipe may be pierced in any situation without the possibility of a drop of blood gaining admission; but the remark is of little value here, for these instruments are seldom carried about a surgeon's person; and I will again repeat, that in cases of asphyxia assistance must be rendered by such means as can be made available on the spot, or need scarcely be attempted at all.

## WOUNDS OF THE LARYNX AND TRACHEA.

### THE OPERATION OF BRONCHOTOMY.

General Remarks on Wounds of the Trachea—Comparison between the Wound inflicted by the Suicide and Bronchotomy—Cases—Bronchotomy suggested at an early period—Symptoms and Pathology of Wounds of the Trachea—Complications—Foreign Bodies—Hæmorrhage—Escape of the Food through the Wound—Second Period of Danger—Inflammation—Question of Bronchotomy discussed.

AT the present day, and in the present state of chirurgical improvement, it is curious to reflect on the unaccountable dread which many of the older practitioners, men otherwise well informed and skilful in the practice of their profession, entertained of injuries of the windpipe; a dread which always made them regard any operation in which this part was interested as little short of murderous. Cælius Aurelianus, in speaking of bronchotomy, after ridiculing the operation as fabulous, reserves all the bitterness of his rebuke until another occasion, lest that he might possibly not speak of it in terms sufficiently severe\*; and Aretæus, whose authority must be considered in a very respectable light, expresses himself most fearfully respecting it, because, as he says, the parts being cartilaginous, were incapable of subsequent reunion. But amongst a number, whose opinions on this subject are nearly alike, the most curious, both in his ideas and in his practice, is Magatus; for he would leave his patients to their fate at once. This surgeon wrote a large work on the subject of wounds alone; and he states, that in-

\* *Ne tantum scelus angusta oratione damnemus.*



juries of the aspera arteria are desperate; that they should only be stitched up, in order to afford the patient an opportunity of confessing his sins; but if there was a loss of substance in these parts, then the case was altogether hopeless, and the surgeon had no more to do than to make his prognostic and go his way\*.

It was of no consequence that other surgeons continually saw wounds of the trachea heal, and patients recover under such circumstances; and that some of the boldest and most sensible amongst them would have undertaken an operation founded on this irrefragable testimony of facts. In opposition to this it was observed, that most persons who had committed suicide by cutting their throats had divided the windpipe; and also that, when animals were butchered, this part was also almost invariably wounded. Hence, it was easy for a man who merely knew that the air which we breathe passes through this tube to attach an undue importance to it, and to imagine that all injuries of it must be attended with inevitable destruction. Thus it came, that a prejudice was raised against any operation that could interfere with parts concerned in the vital process of respiration. It was by some surgeons regarded as a matter of cruel speculation, and by others would not be sanctioned until every other hope had failed, and the patient was absolutely ready to expire†. It is easy to conceive that opinions thus speciously supported and ratified by professional authority could not

\* Si penitus præscissa sit aspera arteria, quamvis desperatus sit casus attamen quoniam multum refert, num ægrotus loqui potest saltem ut propria peccata confiteatur, diligenter consuendum est vulnus. Si autem vulnus cum defectu substantiæ asperæ arteriæ contigerit quoniam nullus potest esse suturæ usus, facto prognostico esset discedendum.

† Nisi cum mors fuerit indicata.

be easily eradicated. Uneducated persons looked on a wound of the windpipe as certainly mortal; and surgeons, although they had seen decisive instances to the contrary, were obliged to shut their eyes against conviction, and absolutely suffer themselves to be persuaded that bronchotomy was a fearful and dangerous operation, only to be attempted as a last resource, and when all other curative means had failed.

Louis says that the ease with which the most complicated wounds of the trachea have been treated and cured, has always appeared to furnish a decisive argument in favour of bronchotomy; an argument which the supporters of the operation have seldom failed to bring forward. But if the probable success of bronchotomy was to be estimated by the usual results of wounds of these parts, particularly when inflicted in an attempt to commit suicide, there would be but slender grounds on which to recommend it in future. The fact is, the two cases are totally and entirely dissimilar. The number of intended suicides that succeed in accomplishing their desperate purpose is infinitely greater than of those that are subsequently saved, although it rarely happens that the wound\* is, from its own na-

\* It is very well known that, in most instances of suicide, the patient perishes rather from lying a long time undiscovered, and the want of instant assistance, than from the importance of the bloodvessels or other parts included in the injury. I have seen the most desperate efforts at self-destruction fail of immediate effect, although it must be confessed that in their results they were but too successful. I have met with a patient who contrived with only a blunt and rusty penknife to divide the windpipe and œsophagus down to the spine without wounding a large vessel, and he lived for three days after the infliction of so dreadful an injury.—A celebrated but unfortunate character, who committed suicide in order to avoid a more ignominious death, and whose anxious desire to terminate his existence at once cannot be doubted, was unable to effect

ture, necessarily mortal. When an unfortunate being lifts a razor against his own life, he throws back his head as far as possible in order to expose his neck to the blow, and probably to bring the windpipe forward, as he imagines that wounds of this organ must be fatal. This position changes the relative situation of all the parts in the neighbourhood of which he is about to strike. In the generality of cases of suicide, the wound is inflicted above the thyroïd cartilage, between it and the os hyoïdes; and as the head is at the same time thrown back, the direction of such wound will be upwards into the mouth rather than across the neck, and must be carried deeper than the angle of the jaw before it can intersect the carotid artery. It would be otherwise if the incision was made at the side of the neck, for there the artery is comparatively superficial; but so seldom is this point chosen, that when it does happen the perpetrator is suspected to have possessed some knowledge of anatomy, and his selecting it would almost afford sufficient grounds for believing that he could not have been deprived of reason at the moment. Ought it to be inferred, then, that the fatal event ensues in consequence of the windpipe being so severely injured? I should conceive not; for there is nothing either in the structure or functions of this organ to render its injuries so extremely perilous; and, besides, there are collateral circumstances that will very well explain the fatality that attends the majority of those cases\*. We have a wretched being to manage, who is, or at least has been, anxious for his own destruction, his purpose, and languished until the sixth day before he died. It appeared by the evidence given on the inquest that three-fourths of the circumference of the windpipe had been cut, yet the bloodvessels escaped.

\* It may be here remarked that few patients of this description ever recover by compulsion, and that the most favourable symptom in such a case will be sorrow on the part of the patient for the rash act he has committed.



tion;—we have a state of mind to combat that is as bad as the injury done to the body;—we have the patient, perhaps, struggling to render all our efforts unavailing;—restless—feverish, and tossing himself about—often he is a raving maniac. We have a transverse wound in the neck, the lips of which will be gaping wide, and which every the slightest motion will be likely to separate still farther,—and we may have a wound in the œsophagus, or some other complication that cannot have place as a result of the mere operation of bronchotomy. But, farther, the cases are very dissimilar when considered as to their progress and the treatment that may become necessary. The wound caused by the operation remains undisturbed, and is not exposed to excitement or irritation; it continues open, but it is desirable that it should do so until the necessity for respiring through it shall have ceased, when it can be closed with facility and unites without inconvenience. On the other hand, it is difficult, sometimes almost impossible, to keep the lips of the suicide's wound in contact, although the patient's safety may depend upon it. At every attempt to swallow, some portion of the food escapes through it, and the mucus which accumulates in the trachea is constantly expelled in this way. Thus is the patient kept in a state of constant agitation, until, wasted by starvation and harassed by fever, death puts a period to his suffering.

In the course of the last winter a man was admitted into the Meath hospital who had attempted to deprive himself of life by cutting his throat. The wound was in the usual situation, between the os hyoides and thyroïd cartilage: no bloodvessel of any consequence was injured, nor was there any thing remarkable in the case, except the deep and sullen resolution the patient maintained to destroy himself by some means or other.

For this purpose, he refused any kind of sustenance, and a tube could not be passed through the mouth or nostril, so violent were his struggles to prevent it; *yet he survived for several months*, receiving no sort of nourishment except what could be derived from enemata of broth or milk. During all this time, the wound, although frequently closed by suture and agglutinative plaster, could not be made to unite. He suffered, as is usual, from severe bronchitis, and an enormous quantity of mucus was secreted, all of which was expelled through the wound, no matter what pains were taken to prevent it. At length he perished, a perfect example of death from inanition, and one of the most melancholy yet horrifying spectacles that humanity could exhibit.

There is a case of attempted suicide recorded by Mr. Houston, which afterwards came under my care in the Meath hospital; it is published in the Dublin Hospital Reports, vol. v, p. 315, and, therefore, it is unnecessary to mention more here, than that the epiglottis was severed from its superior and lateral attachments, floated like a valve, and on every act of inspiration fell on the larynx and closed it up. To remedy this inconvenience, which tended every moment to suffocate the patient, the top of the epiglottis was brought over the edge of the thyroid cartilage, and secured to its anterior surface by a single stitch. This answered the immediate purpose extremely well, but was followed by unhappy consequences; for by the following morning the epiglottis was found fastened in its new situation by adhesive inflammation, and the patient thus placed in the condition of a person from whom the cartilage had been cut away altogether. The constant irritation he endured when he attempted to swallow, and the convulsive cough that ensued, prevented the closure of the external wound, and assisted in the

production of the erysipelatous inflammation of which he shortly afterwards died.

I have alluded to these cases with a double motive ; first, to shew that there can be no analogy between the simple operation and the suicide's wound, with all its desperate complications ; and, secondly, in order to offer a suggestion as to the possibility of saving such patients by the performance of bronchotomy. A proposal like this at the present day will probably appear strange, unless in the very obvious instance of such a degree of tumefaction being occasioned by the inflammation of the wound as would prevent the free passage of the air. But I have watched many of these cases with a most intense interest, and believe that, unless the external wound is perfectly healed at a comparatively early period after its infliction, there is little or no chance of recovery for the patient : at all events, it will be conceded that such an occurrence is most desirable. Now, the causes that prevent this union are, the passage of portions of the food into the larynx, and the escape of it or of mucus through the wound. As long as there is any exciting cause of cough present, the lips of the incision will be shaken and disturbed, the sutures will be forced through the integuments, and a passage created for the substance about to be expelled. In order then to obviate these unpleasant occurrences, it might be advisable, after the wound had been dressed, to prevent any attempt whatever to swallow during a sufficient time, to allow of the adhesive inflammation being fully established ; and if bronchitis has appeared, and mucus is secreted in quantity, to perform bronchotomy in order to procure an aperture for its free escape without irritating or disturbing the wound. In a word, the principle of the suggestion is, to procure for the injured parts a perfect and complete state of re-



pose, with a view to the accomplishment of union by the first intention.

This must, however, be understood as being only a suggestion, for I have not put it into practice, and therefore cannot speak with the confidence derived from experience ; and, also, that I by no means consider it to be the proper treatment for all wounds of this description, or even for the majority of them ; but only that, occasionally, cases occur that might possibly thus be saved, but which now are too generally lost. For the rest, I would not permit an attempt to swallow even a drop of liquid, because I know the patient can be sufficiently nourished without it : I would not try to introduce a tube into the œsophagus, because the effort produces great irritation and violent paroxysms of cough ; and as to the infliction of an additional wound, I have now performed the operation of bronchotomy so often, and observed its effects so accurately, that I can speak on this subject with confidence, and have no hesitation in averring that it can add little or nothing to the patient's danger.

In endeavouring, then, to form a just estimate of the peril to which a patient may be exposed by submitting to the operation, all adventitious circumstances and unfavourable combinations should be placed entirely out of the question, and the decision should rest on the known qualities of the parts interested by it, both as to structure and function. It is next to impossible that an accidental wound should bear an exact similitude to one inflicted by the surgeon's knife, and it is therefore not just to institute comparisons between them ; but even in this point of view it can stand the test of rigorous investigation, for it is always undertaken for the relief of mortal affections, of diseases

that will otherwise sooner or later bring the patient to a miserable death; and therefore, even supposing it to be attended with tenfold the peril that it really is, it would form no argument against the operation, unless it be decided that it is better a patient should certainly die, than run the risk of an attempt which has both reason and experience to recommend it.

At the instant that an aperture is made in the larynx or trachea, either by operation or by accident, the patient experiences a sensation of uneasiness and distress that cannot be explained. If lying down, he suddenly starts up, or writhes and tosses himself about, and almost immediately is seized with a paroxysm of cough. The expectoration is streaked and stained with blood, and, if a bloodvessel happens to be injured, the quantity of this fluid poured into the windpipe and subsequently thrown off may be so considerable, as to create great uneasiness to the patient, and occasion some alarm to the surgeon. This symptom, combined with the almost convulsive struggles which the patient makes to relieve himself, presents a frightful appearance; but in general his own efforts are sufficient, and very rarely does any bad consequence ensue from blood being poured into the larynx, unless where some very large vessel is wounded, and the hæmorrhage is so profuse as to suffocate the patient almost instantaneously. The air passes through the wound with a peculiar hissing noise, and this will be louder or not according to the proportion the new aperture bears to the natural size of the rima glottidis. Frothy mucus is expelled through the wound with a gurgling sound, and the blood is often expectorated in this way. The patient's voice is lost, and he can only express himself by signs.

After a little time, perhaps in the course of six-and-thirty

hours, the process of inflammation begins to be set up; the wound now is puffed, swollen, and its edges turned outwards; it is tender to the touch, and its surface is dry from the passage of the air through it. There is a quantity of inspissated mucus round the edge of the opening into the trachea, which, if allowed to accumulate, interferes with the passage of the air and occasions considerable distress. The mucous expectorations are thrown out through the wound, and sucked back again if not instantly removed, so as to produce a troublesome and teasing cough. The danger of such a wound is principally to be estimated by the accompanying circumstances, for simple incised wounds without complication generally heal with great rapidity; so that, in cases where it may be an object to the surgeon to keep them open, such intention is often attended with considerable difficulty. The chief if not the only danger to be apprehended in such cases is from bronchitis, which follows on every perforating wound of the larynx or trachea. Injuries, however, that are more extensive, or inflicted by great violence, such as gunshot wounds, are seldom so easily gotten over: there will certainly be very high inflammatory action and consequent tumefaction in all the parts subjected to the injury: there may be erysipelatous or diffuse inflammation of the sub-mucous structure, or of the cellular membrane in the neighbourhood; there might also be abscesses formed in some of the adjacent parts; or, in cases attended with great laceration or loss of substance, the wound may never be perfectly closed, and an aërial fistula may be produced. When the trachea of a person who had been the subject of bronchotomy, or other similar trivial wound, is examined, the loss of substance in this organ is found to be replaced by the formation of a new structure, ligamento-cartilaginous in its nature, and in some respects resembling that which forms the connecting medium of fractured bones when



the divided extremities are far removed from each other. It is not so when the injury has been more extensive.

Wounds of the larynx and trachea, then, become troublesome or dangerous only from collateral circumstances, and these may be arranged as occurring immediately or soon after the infliction of the injury, or as being the results of inflammation, and consequently appearing at a period somewhat more remote. Thus, foreign bodies may be left remaining in the trachea; or blood may flow into it with great rapidity; or, in the event of the œsophagus also being wounded, any substance swallowed may be forced through the corresponding wound into the wind-pipe; or if the epiglottis be separated from the thyroïd cartilage, every attempt to swallow must be imperfect, and substances will be constantly falling into the larynx, producing a teasing cough, harassing the patient, and preventing the wound from healing, if they cause no greater injury.

1. When foreign bodies have been forced through a wound into the trachea, or when such have been left fixed and impacted therein, they should be extracted with the least possible delay, for their presence always excites troublesome and dangerous symptoms. If they are loose and floating within the cavity of this tube, their extraction will be easily effected by dilating the original wound, and allowing room for their expulsion in the act of expiration. There may be some little difficulty experienced by the operator in removing a foreign body, such as a bullet, the head of an arrow, &c. which is firmly fixed in the trachea, and perhaps occupies a situation where it cannot be easily come at; but as the danger of permitting such foreign substance is always urgent, and must be greater than that likely to result from any additional wound,

there should be no hesitation in undertaking its removal wherever such operation is practicable.

2. Hæmorrhage into the trachea I have already mentioned as an extremely distressing symptom, and one which may possibly prove embarrassing to the surgeon. In order, however, to appreciate the danger likely to arise from this accident, several circumstances must be taken into consideration, amongst which are the size and situation of the wounded vessels, the size of the wound in the trachea, and the possibility of the vessel being secured either by ligature or otherwise. If there is a wound of a large vessel, and consequent profuse hæmorrhage accompanied by an extensive injury of the larynx or trachea, there is seldom much time to apply for professional aid, and in such a case, and thus circumstanced, the patient must be singularly fortunate if he escapes at all. In most cases of attempted suicide the wound is situated between the thyroïd cartilage and the os hyoïdes, and fortunately there are no vessels in that space likely to give rise to a fatal hæmorrhage: here, however, some branches of the superior thyroïd artery may be wounded, or in some circumstances even of the lingual, and these will pour forth a sufficient quantity of blood to render the patient's situation both distressing and alarming. It is easy for a practitioner to talk of tying the bleeding vessel, and thus restraining the hæmorrhage; but it is sometimes a difficult matter to do it, and the young surgeon should be prepared to encounter cases of the most teasing and perplexing nature. The patient is anxious, agitated, and restless; perhaps he is tossing about in the frenzy of delirium; the blood is flowing freely into the larynx, and there is incessant cough, and sometimes convulsive struggling to maintain respiration: every plunge of the needle or tenaculum causes the patient to start away, and thus it be-

comes almost impossible to pass a ligature around the bleeding vessel. Perhaps the patient faints, and this is a fortunate circumstance, for then the surgeon, guided by the oozing of the blood, is enabled to take up the vessel without disturbance, or he seizes the moment to unite the wound, trusting to the formation of a coagulum and external pressure for restraining future hæmorrhage. In all cases, except where some very large artery is wounded, it is better at once to close the wound; for the air passing through it acts by suction on its sides, and draws a quantity of blood with it into the windpipe, and thus creates and maintains a constant source of irritation. I have seen this latter occurrence to take place even where no artery was wounded, and the hæmorrhage and all its accompanying disturbance thus continued for a considerable length of time.

3. But in those cases where the substances intended to be conveyed into the stomach find a ready passage into the windpipe, it will be necessary to remedy the inconvenience by preventing every natural attempt to swallow on the part of the patient. This is easily effected by the introduction of a hollow elastic tube into the stomach, or into that part of the œsophagus which is situated below the wound, through which the requisite food and medicine may be safely conveyed. The annoyance that this would occasion by lying in the mouth, independently of the retching it produces on its introduction, must always determine us on passing it by the nostril; and here it is requisite to observe the greatest caution, and to be perfectly certain that the instrument is in the œsophagus before any liquid is injected, for instances of fatal mistakes have occurred from not attending to this precaution. Any elastic substance introduced by the nostril will strike the spine nearly behind the uvula, and its point will thus be directed forwards and downwards, in-



stead of backwards and downwards, so that its natural tendency will be to pass into the larynx, and not into the œsophagus. Nor will a lighted candle held before the orifice of the tube, which is the best criterion we have to judge by, prove a certain test, unless it be persevered in for a given time, so as to shew the regular alternations of inspiration and expiration. It is very easy to conceive, that air may pass through a tube from the stomach, particularly at its first introduction; and on the other hand the instrument might be in the trachea, and yet no air pass through it, in consequence of its being choaked with mucus, or lying entangled in a fold of the lining membrane. The cough excited on its introduction will be no criterion; for it is impossible to pass the instrument without more or less irritating the larynx, and thereby exciting its sensibility.

In cases where it is probable we should be obliged to resort to this measure, it will be most advisable to do so at once, and at the first dressing; and when the tube is introduced, and we are certain it is in the proper situation, it should be suffered to remain there as long as possible; for every successive introduction will produce irritation similar to the first, although not to the same extent, whereas our chief object should be the attainment and maintenance of the most perfect quietude. When two tubes have been introduced, one into the œsophagus and the other into the larynx, it will be necessary to mark them by threads of different coloured silk, so as to prevent the occurrence of any unfortunate mistake.

The second period of danger occurs when inflammation has commenced, and, the rima glottidis becoming obstructed, the patient may either perish by rapid suffocation, or from diseased actions taking place in the lungs in consequence of an insuffi-

cient supply of air. To counteract the baneful effects of these accidents there have been three modes of proceeding recommended, all having the same object, namely, the artificial admission of air to the lungs, and all calculated, under particular circumstances, to answer the end desired; so that the only inquiry is, what may be the particular case to which each may be most judiciously adapted. These are—

1. The introduction of a hollow tube through the original wound.

2. The performance of the operation of bronchotomy.

3. The introduction of an elastic tube through the nostril into the trachea.

The last has the advantage of the authority and recommendation of Desault.

The first can only be applicable to that species of injury in which there is no hope of union by the first intention; such as lacerated, contused, or gunshot wounds. In accidents of this description, the parts which are torn or struck are killed, and must be subsequently thrown off: there will be extensive loss of substance, and consequent suppuration; and if the introduction of a tube through the original wound can be executed with facility, it would be absurd to undertake any other operation. But it must be recollected that the introduction is not called for in the first instance, and immediately after the receipt of the injury; but after an interval of two or three days, when inflammation has not only commenced, but proceeded to the extent of nearly excluding the air. The parts are then swollen and

tense and painful ; and the mere existence of the tumefaction will render the introduction of a tube difficult, if not impossible. There can be no doubt that in some particular cases this mode of procuring relief may appear reasonable and judicious ; but they must be few in number, and can only be of that description already noticed. Whenever it is of importance to attempt the union of the external wound, such practice would be inadvisable, and our choice must rest between bronchotomy and Desault's elastic tubes.

That it is at all times desirable to avoid the pain and danger of an operation, is a question completely settled by the modern practice of surgery ; and now no man thinks of employing the knife until every other rational hope has faded away, and nothing else appears likely to preserve the patient's life. Guided by this principle, we should be disposed at once to give the preference to the elastic tube, and to say that it was a decided improvement in the treatment of wounds of the throat, if we did not at the same time recollect that the introduction is an operation in itself by no means free from danger ;—that it is extremely difficult to be performed ;—that awkward and reiterated attempts, produce inconceivable distress ;—and that even when performed with the greatest dexterity, it must invariably excite cough and restlessness, symptoms most disagreeable, and often disastrous, particularly where it is desirable to maintain the edges of the wound in contact, or where arteries have been secured by ligature. We must therefore candidly examine the arguments by which the expediency of either operation is supported, in order to be able to decide on that which will appear most beneficial to the patient.

Desault states the disadvantages of bronchotomy to be as follow :—



1. The danger of superadding one wound to another, and of a new inflammation occurring in the recent wound, the effect of which might be as injurious as those of the original one.

2. The effusion of blood, either externally or into the trachea.

3. The having another wound to cure.

4. The fear of the wound created by the operation not perfectly uniting, and an aërial fistula remaining.

1. It is one great objection to the use of the elastic tubes, that the mere circumstance of their being called for at all, indicates a closing up of the rima glottidis, and, of course, a proportionate difficulty of introducing them. Notwithstanding this, however, there cannot be a doubt of the possibility of their introduction in some instances; and the pathology of mucous membranes in general teaches us, that after some time the uneasiness at first created will subside, and that each successive introduction will be performed with more facility. They may, therefore, occasionally supersede the necessity of bronchotomy; but at the same time it cannot be allowed that they are capable of so extensive an employment, or that they can be so easily introduced by an unpractised hand as might be, at first, imagined. When a wound occurs in the larynx, the inflammation may be such as to interfere rapidly with respiration, and we are called on to do something immediately in order to restore so important a function. Let us suppose a man, who had seldom or perhaps never undertaken such an operation before, attempting to introduce an elastic tube into the trachea: every time the instrument touches the larynx the patient becomes

anxious and restless; he tosses himself about, and coughs convulsively, and each motion, whilst it increases his own distress, renders the performance of the operation more difficult. Can any man with a recent wound, with dreadful dyspnœa, with some bloodvessels just secured, and others perhaps ready to burst out on any exertion; can such a patient endure the irritation that a few moments' unsuccessful poking at the rima glottidis will inevitably occasion? And if he cannot, may not the present distress be more intolerable, and the future consequences more destructive than those which would result from an operation, the only fearful part of which is, that it is performed with a cutting instrument?

These observations were necessary before the consideration of Desault's first objection could come fairly into view, because it would seem that where inflammation had occurred in the mucous membrane it would be disposed to spread, and that a new source of irritation would be only an addition to the danger. The objection, then, must be considered as just, if there be reason to suppose that such inflammation is present, but experience proves that the fact is directly the reverse: the membrane is not inflamed, and the obstruction of the rima glottidis depends on the tumefaction of the neighbouring parts; an obstruction, which if it interferes with the passage of so subtile a fluid as air, must of course impede the introduction of any tube, but which by no means implies the existence of a disease that is disposed to spread. Let it be considered, too, that if the mucous membrane of the larynx is inflamed, it will probably be as likely to spread in consequence of the irritation created by the presence of an extraneous body, as by an additional wound; and, moreover, that in either case the patient will in all probability eventually perish. These circumstances will enable the sur-

geon to form a just estimate of the relative importance that should be attached to each operation.

Desault calls bronchotomy, "*une plaie toujours facheuse*," and therefore it might seem to be an operation pregnant either with difficulty to the operator, or danger to the patient. That it is sometimes troublesome in the performance is certainly true, particularly in children; but it is equally so that its difficulty is exaggerated, and can always be overcome, if the operator is only aware of the inconveniences he has to encounter. It must also be conceded, that there may be some possible risk to the patient; but then, in order to an unfortunate result, there must be a combination both of untoward circumstances on the part of the patient, and either of ignorance or want of caution on that of the practitioner. But we are, here, to speak of the operation properly performed; and there can be little doubt that, if it be so, it adds nothing to the patient's danger beyond that which might accrue from the introduction of an elastic tube, whilst in the hands of most surgeons it is far more easily accomplished.

2. The effusion of blood, either externally, or into the trachea, is a circumstance so embarrassing, that it has been advanced as a strong argument why the operation should not be resorted to, if any other mode of relief was at all practicable. A child was brought to Desault in order to have the operation performed, and at the first incision, so great was the flow of blood, that he was obliged to desist for some time, and in the interval the patient perished. That such an unfortunate occurrence should have made a due impression on the mind of the operator, and induced him to consider hæmorrhage as a most powerful objection to the performance of the operation, is only



natural ; but certainly such an accident ought not to influence our minds too strongly, if it can be proved that where hæmorrhage does occur, it is generally the consequence of a want of caution. There are many sources from which it is supposed that blood may be furnished in considerable quantity ; but of these some are irregular vascular distributions, seldom to be met with ; and others, however constantly present, may always be avoided by an operator who is aware of their existence.

It constantly happens that large veins are exposed during an operation, which, if heedlessly divided, might pour out a very considerable quantity of blood : but they are easily drawn to one side by a curved probe or director, and may in every instance be avoided, if the operator proceeds with caution, and examines the part previous to each successive stroke of the knife. The thyroïd veins, when regularly disposed, are seldom within danger of being wounded ; but in some instances they unite into one large trunk about half an inch below the cricoïd cartilage, which passes down the neck, deeply seated, and exactly in front of the trachea. This large vessel will be very probably wounded by an incautious operator, but can always be drawn aside and avoided, if care be taken in examining whether it is present or not.

It generally happens that a large branch of the external jugular vein passes down on each side, along the anterior edge of the mastoïdeus muscle, and unites with its fellow at the lower part of the neck, immediately above the sternum, somewhat resembling the figure of the letter v. In performing the operation of tracheotomy, if the knife be carried too low down, the junction of these vessels may be injured, and a very profuse hæmorrhage ensue. It is also said that the vena innominata

might in like manner possibly be wounded ; but this is an accident of which I can scarcely conceive the occurrence, this vessel lying behind the sternum, and being protected besides by the inter-clavicular ligament. An operator must, therefore, be strangely intent on mischief who could plunge his knife down in such a manner as to wound a vessel thus placed so completely out of the way.

The ascending branch of the thyroïd artery is, in some rare instances, found to come off from the arch of the aorta, and to proceed upwards in front of the trachea. This might be wounded ; and although it is by no means a large artery, yet, being a branch of so considerable a vessel as the aorta, it might be expected to bleed profusely. This would prove a most embarrassing circumstance, from the difficulty of passing a ligature round the vessel, and thus securing it in a satisfactory manner. The trachea, as it passes down the neck, seems to retreat backwards, so as to get behind the sternum, and at that part where it is opened in tracheotomy it is nearly an inch and a half from the surface. Let not a young practitioner, then, conceive that it is easy to turn a needle in such a cavity as this, where the external incision is of necessity so small, and moreover where the patient is restless and uneasy, or perhaps struggling under the horror of impending suffocation. These difficulties, however, are only mentioned for the purpose of inculcating the advantages of proceeding slowly and with caution ; for the vessel, if wounded, must be tied, and the delay and inconvenience attending it would add considerably to the patient's sufferings, and might perhaps render the whole operation unavailing. It is fortunate that this irregular distribution is of very rare occurrence. It might never be met with in a patient requiring the operation ; but the knowledge of the possibility of its existence

will be decidedly useful if it renders the operator cautious in his proceedings.

A wound of either of the lobes of the thyroïd gland will most certainly be followed by profuse bleeding, and I have seen some embarrassment occasioned by this accident. If an assistant, in drawing aside the edges of the external incision in order to expose the deeper parts of the wound, drags them unevenly, the bottom of the incision will no longer correspond to the central line of the neck ; and if the operation is proceeded on, it is very probable that the gland may be wounded deeply. Hence the importance not only of commencing at first exactly in the centre of the neck, but of carefully preserving the same direction until the operation is concluded. In some subjects the lobes of the gland advance farther across the trachea than in others; and I have met with some instances in which the connecting slip between the two lobes was thick and broad, so as to have lain exactly under the stroke of the knife. In ordinary cases this part is almost always divided; but it is evident that the inosculating branches which lie within it must be very small, and will contract without pouring out more than a few drops of blood.

It is said that the thymus gland in young children might be wounded, and a troublesome hæmorrhage ensue. This is an accident very unlikely to occur, for this part is not much exposed to danger, and, if it was even injured, it would not furnish much blood. The real fact is, that the operation of tracheotomy performed on a child is almost always attended with considerable bleeding, for the superficial veins of the neck are turgid with blood; and the very cause which would render the operation necessary, namely, obstructed respiration, tends to maintain them



in this condition. And there are so many real difficulties to be encountered with young subjects, that the surgeon should scarcely burden his mind with this one, which is, perhaps, little more than imaginary\*.

3. The circumstance of having another wound to cure is an objection which can only have place where the operation is called for in consequence of extraneous bodies being lodged in the trachea, or inflammation resulting from the previous violence. If a foreign body has been driven into the trachea, it must be removed, either by dilating the old wound, or inflicting a new ; and so as the object is accomplished with the least inconvenience to the patient, it is not worth quarrelling about the means. But where inflammation has occurred, the new opening must be somewhere below the cause of obstruction ; and if this can be effected by dilating the original wound, and introducing a tube, there can surely be no objection to the practice.

\* There are other irregular vascular distributions noticed by authors, which however infrequent of occurrence, ought still to be borne in mind by a cautious operator. Allan Burns saw the *arteria innominata* mount on the fore part of the neck as high as the inferior edge of the thyroid gland ; and the right carotid cross the trachea in such a direction as would inevitably cause it to be wounded in tracheotomy. In cases where both carotids come from the *arteria innominata*, the left crosses the trachea high up in the neck. I have not myself had an opportunity of seeing such irregular distributions ; but in a case of abscess seated deeply in the neck, which occurred lately, there was such strong arterial pulsation in front of the trachea an inch and a half above the sternum, that I was afraid of cutting for the matter in the exact point in which it was situated. Possibly this was a case of one of those arterial irregularities.

Desault mentions that the carotid was opened in an operation, in consequence of the trachea not being firmly fixed, and the patient was lost : he does not state whether it was an irregular distribution.

However, in either case, a clean incision of the surgeon's knife will be much more likely to heal than an injury caused by violence; and as it will give little trouble, and not add one hour to the confinement the patient must undergo, it can scarcely be advanced as an argument against an operation which may possibly be deemed necessary to preserve his existence.

4. It appears almost certain, that the last objection of Desault, that of an apprehension of an aërial fistula remaining after the operation, was advanced rather on theory than actual experience, and was probably founded on the old doctrine, that the windpipe, being of a cartilaginous structure, would not heal. It is not unlikely that this great French surgeon had performed bronchotomy more than once, and that he had seen many instances of wounds of the windpipe; and he must have known that this organ, considering its general deficiency of organization and its want of vascularity, would heal as well as any other part of the body of similar structure; and that it would really be more difficult to keep such a wound open for any length of time than to heal it up. It was probably advanced as a theoretic argument in favour of his own elastic tubes; but that it has no foundation in fact, may be inferred from the circumstance that Desault himself states no case to warrant a belief in the existence of these aërial fistulæ; and if a single one had occurred within his knowledge which could have answered this purpose, it is more than probable he would not have passed it over in silence.

In my own experience I have met with but one case of aërial fistulæ, in the person of a soldier in the East India Company's service, who received a wound from canister-shot on the 3d January 1825.

The wound seems to have occupied the upper and fore-part of the neck, comprising the whole length of the thyroïd cartilage, the cricoïd and two or three rings of the trachea: it is all healed by an irregular cicatrix resembling that succeeding a burn, except one spot corresponding to the space between the thyroïd and cricoïd cartilages, where there is a fistulous opening large enough to admit a goose quill, through which he breathes and occasionally expels mucus by coughing. Its edges are quite callous and there is no discharge. Patient can speak; but if he wishes to articulate very distinctly, he must close the aperture with his finger.

I made an attempt to cure this man, by detaching some of the newly-formed adhesions, scraping the edges of the fistula, and endeavouring to unite them by the twisted suture; but it did not succeed, and he still lives, breathing through the fistulous aperture.

Having considered all the cases in which it might be possible to substitute the introduction of a tube for the operation of bronchotomy, it appears to me there is one, and one only, in which such practice might be considered judicious; namely, in the case of suspended animation, as before stated in the chapter on that subject. In the instance of wounds, wherever there was anxiety, restlessness, and pain, or where there were large or important bloodvessels wounded, I should prefer the simple operation of bronchotomy to the vexatious and irritating process of introducing a tube by the nares.

When the larynx itself is inflamed, either in consequence of injury or idiopathic disease, I fear the introduction of a tube would only add to the existing mischief; and as a general rule,



wherever instant decision and celerity of operation might be required, I would give a decided preference to the relief afforded by opening the larynx or the trachea.

## THE OPERATION OF BRONCHOTOMY.

Bronchotomy a generic Term—Laryngotomy—how performed—Tracheotomy—how performed—Danger of Hæmorrhage—After-symptoms and Progress of the Case—Conclusion.

HAVING endeavoured to determine those cases in which it might be advisable to make an artificial opening into the wind-pipe, I shall proceed to offer a few observations on the different modes of effecting this object, and on the symptoms which usually follow the operation.

Bronchotomy, as a generic term, is subdivided into laryngotomy and tracheotomy, operations essentially different as to the facility attending the performance of each, and as to the subsequent phenomena resulting from them. They take their names from the part of the respiratory tube into which the artificial opening is made.

Laryngotomy consists in opening into the inferior part of the larynx, in that small triangular membranous space which lies between the thyroïd and cricoïd cartilages. It is an operation unattended either with difficulty or danger, and will answer every purpose when the cause of obstruction is seated in the rima glottidis, or above it. It is accomplished by a small incision extending along the centre of the neck, about an inch in

length, and exactly over that part of the windpipe which it is intended to open. The incision is then carried deeper, between the sterno-hyoïdei muscles, the sterno-thyroïdei, and the crico-thyroïdei; and the larynx being exposed, it is either punctured with a bronchotomy trochar, or a piece of the tube is cut out. If a canula be introduced, the patient at the moment experiences some distress; and if the instrument is not firmly held, it is thrown out again with violence to a considerable distance. This state of irritation soon subsides, and after a few minutes the instrument is suffered to remain quietly in the wound until inflammation occurs; after which period its presence creates so much distress, that it can seldom be longer endured.

Tracheotomy is performed much lower down in the neck, the incision is of necessity longer and deeper, and it is not always an operation easily to be performed. In children it is particularly difficult, as the depth of the parts to be cut through is increased by the accumulation of fat generally met with in patients at this period of life; and besides, previous to the age of thirteen or fourteen years, the trachea is comparatively of a small size\*. The greater vascularity of children, too, adds to the difficulty by producing a troublesome hæmorrhage, and their struggles and general unmanageability tend to embarrass the operator. It must therefore always, and under every circumstance, be an unpleasant operation to perform on a patient much under the age of puberty; but after that period it is completed with more facility, and very seldom, indeed, occasions any trouble worth remarking on.

In performing the operation, it is always desirable to have

\* I have known an instance in which a surgeon attempted to perform the operation on a child, and was obliged to give it up, as he absolutely could not find the trachea!

the patient lying down on a low bed or sofa ; his head thrown back as far as he can bear it, in order to extend the neck and render the parts tense ; and he should be so placed that the operator might stand at his head. The first incision should be from two to three inches in length, extending from about half an inch above the centre of the sternum to a little above the cricoid cartilage, and should occupy the exact central line of the neck\*. The skin and cellular substance should now be drawn to each side by means of bent probes, and, if any vessel appears exposed to the knife, it may be withdrawn in a similar manner. The incision is then to be carried deeper between the sterno-hyoidei muscles, and so on until a fascia is discovered lying before the trachea, which must be carefully removed. Behind this membrane, the windpipe is seen, moving upwards and downwards according to the degree of disordered respiration and the patient's efforts to relieve himself ; and if an attempt be made to open the trachea without removing this fascia, the aperture in the one will not correspond with that in the other ;—the patient will not be relieved, and the introduction of a canula will be difficult, if not impossible. This membrane is easily laid hold on by a pair of dissecting forceps, and may be removed either by the knife or a pair of scissors. The trachea then comes into view, and the large thyroïd vein (in the event of an irregular distribution) should be looked for in order to be avoided. Hæmorrhage should now be completely

\* Desault mentions an awkward accident that probably occurred from inattention in this particular, “un étudiant tombe, en se baignant, dans un précipice, dont il est retiré sans connoissance. Un de ses camarades veut, pour le rapeller a la vie, faire le tracheotomié ; le canal est mal assujetti : la carotide est ouverte ; et le malade périt victime des hasards d'une operation inutile dans tous les cas, mais qui pratiquée au larynx n'auroit eu sans doute que cet inconvenient.”



commanded ; and if the symptoms of the case will admit of delay, the surgeon might wait a few minutes in order that even the oozing of blood from the sides of the wound may cease. A small slit is then to be made in the trachea at the point where it is intended to be opened, so as to permit the introduction of a hook or forceps in order to lay hold on the part to be removed, which should be cut out as nearly as possible to the size and shape of the canula that is to occupy it afterwards\*. At the instant that the first puncture is made in the trachea, the patient seems to experience some extraordinary sensation of distress : he starts up and struggles for a moment, but it soon subsides, and the operation is finished without much trouble. He is in general greatly relieved, and in a few minutes falls into a calm and refreshing slumber. In order to prevent the canula from falling out, it is usually secured by tapes passed through its rings, and tied behind the patient's neck ; and a light thin muslin cloth may be thrown loosely over it, to prevent the admission of dust or any other extraneous substance.

Many surgeons recommend the removal of a circular portion of the trachea to the extent of the length of two or three rings, and that it should be left so, without the introduction of any canula whatever. If the operation be performed on the larynx, there can be no objection to this mode of proceeding, for the wound is not extensive, and the hæmorrhage must be trivial. But the trachea lies deep ; there is more likelihood of meeting with a troublesome or embarrassing flow of blood to delay the operation ; and even supposing that no vessel of consequence is

\* It is obvious that this does not apply to operations performed for the removal of foreign bodies from the trachea. In cases of this description a long slit will be sufficient, which, after the extraction is completed, may be closed immediately, and healed.

wounded, the patient at every inspiration sucks in a quantity of blood from the open sides of the incision, and the cough, expectoration of bloody mucus, and other harassing symptoms, are thus continued for a length of time. It is evident, that if a canula occupied the entire space of the aperture in the trachea, a drop of blood could not enter, notwithstanding the existence of even a profuse hæmorrhage; and therefore if this instrument is employed, it will be necessary to be accurate in opening into the windpipe, so that it should occupy the entire wound. This object would be well answered by performing the operation with a trochar, which might be employed in perforating the windpipe; but this requires some dexterity, and might possibly be the cause of an unpleasant accident. However, under every circumstance requiring instant decision, I would endeavour to make use of the canula; for it has happened that a patient has been lost whilst the surgeon delayed the opening into the trachea in order previously to control an alarming hæmorrhage. Besides, the objection that the presence of the instrument causes irritation is not valid with respect to the trachea. It is true that, introduced into the larynx, it might create uneasiness, and be with difficulty retained; but the sensibility of the lining membrane of the trachea is much inferior, and a canula can be easily endured in the latter for the first thirty-six or forty-eight hours after the operation.

The surgeon, or an experienced assistant, should always remain with the patient until the hæmorrhage from the wound has been completely controlled, and perhaps for some short time afterwards; for I have known very serious and troublesome losses of blood at a period when such an accident could scarcely have been calculated upon. In a very recent case, a gentleman suffering under acute cynanche laryngea was ope-

rated upon, and a longitudinal slit effected in the windpipe, through which a tube was pushed: the patient was put to bed, and left by the operator (who was obliged to go some little way into the country) apparently quite safe, but with directions, that I should be sent for if any thing unpleasant occurred. In about half an hour afterwards I was summoned in great haste, and informed that the patient was bleeding to death. I found him sitting up in his chair, breathing with great difficulty, for the tube had slipped out of the trachea, and bleeding more profusely than I had ever witnessed from any similar wound. There was a coagulum on the floor at his feet as large as a liver. On examination I found that the hæmorrhage was venous, and that it did not proceed from any distinct vessel, but gushed from every part of the wound. It was controlled by cutting out a portion of the trachea corresponding as nearly as possible to the size of the canula, which was then introduced, and the wound all round it tightly plugged up with sponge.

It occurs sometimes that a patient has to undergo a second operation, as in the case I have before alluded to, of a portion of the tube being broken off and falling into the windpipe. In these cases the incision through the cicatrix of the former wound may occasion a very troublesome hæmorrhage; for this newly-formed structure is devoid of cellular membrane, and the divided vessels cannot either contract or become retracted. After an operation of this description, I was on one occasion obliged to have recourse to the actual cautery.

When two or three days have elapsed, the wound begins to inflame; its edges are turned out, its surface is dried up from the action of the air, and its bottom round the edges of the opening into the trachea is covered with a tough, adherent, and



inspissated mucus. These symptoms may be alleviated by smearing the wound over with a feather dipped in oil of almonds. At this period, too, the presence of the canula may cause great irritation, and as it is no longer necessary it ought not to be permitted to remain. It sometimes happens (and particularly when the operation has been performed with a trochar), that, either from tumefaction or an accumulation of mucus, the aperture in the trachea becomes slightly obstructed, and is no longer capable of transmitting a sufficient supply of air; the patient's distress partially returns, and it becomes necessary to remove another portion of the trachea so as to enlarge the aperture. This may be effected with the greatest ease, and produces no inconvenience whatever to the patient.

Amongst the most annoying symptoms both to the patient and to his medical attendant, may be mentioned, the accumulation of mucus in the trachea, and the difficulty of expelling it. When the patient coughs, this mucus is thrown out into the wound, but sucked in again at the next inspiration, so that he becomes wearied with these repeated efforts, and sometimes appears to sink into an alarming state of debility. The assistant must be constantly on the watch to catch the expectoration, and remove it with a probe immediately on its being expelled; and I have known two instances in which a far more disagreeable service was requisite in order to preserve the patient's existence. When a patient is almost suffocated with this substance, struggling for breath, and so debilitated as to be unable to assist himself, I have seen an assistant place his lips to the wound, and empty the trachea by suction. This is really so disgusting an operation, that nothing less than the utmost zeal in his profession could induce a young man to undertake it; yet to it I owe the life of a patient on whom I operated several years

ago, and who is now living, an example of what may be accomplished by the unsparing zeal of a pupil, anxious in the cultivation of his profession.

In the case of a patient on whom I operated lately, the accumulation of mucus was enormous, whilst his debility was so great that he was unequal even to the exertion of coughing. From this state he was relieved by the application of a syringe to the aperture in the trachea, by which a quantity of mucus was removed; and the patient became so much relieved, that in a short time he was able to assist himself, and succeeded completely in expelling several ounces of this fluid mixed with large flakes of lymph.

The general treatment of the wound afterwards must depend on a variety of circumstances, both as to the patient's constitution and the cause which originally led to the performance of the operation. In some instances it may be healed up much sooner than in others, but in most it will seldom be necessary to maintain it open longer than three weeks or a month; for if the disease (whatever that may be) has not subsided in that space of time, there will be reason to fear that some organic derangement is present, that the operation must prove unsuccessful, and the patient eventually perish, or be obliged to breathe for ever afterwards through the artificial opening. When it is determined to close the wound, its edges may be drawn together by straps of adhesive plaister, maintained so during a few days, and there need be no doubt entertained of a certain and permanent cure.

## CONCLUSION.

IN the course of the investigations to which I was led during the construction of the foregoing pages, I found, though without much regret, that fewer of my observations could lay claim to originality than I had at first supposed. This circumstance has not deterred me from laying this little work before the public, not only with a view to spare the student's labour in searching through a multiplicity of books, but for the purpose of arranging the morbid affections to which the larynx and trachea are subject, and discriminating between those in which surgical aid may be available, and those to which it is altogether inapplicable. Nothing is more common than to see a patient languishing with laryngeal disease until life is nearly extinct, and then undergoing the pain and inconvenience of an operation that must of necessity be hopeless; and hence it happens, not only that bronchotomy is considered as uncertain in its results, but that surgeons are unwilling to undertake it unless they can justify themselves by considering it as a last resource. I believe that most of this uncertainty in practice arises from a want of arrangement; from not having those cases separated in which operation may prove serviceable, from those which must inevitably have a fatal termination; and therefore it will be found that I have rather endeavoured to demonstrate the inutility of operating when particular symptoms are present, than even to encourage the employment of the knife under other circumstances. In pursuit of the views which I had long since taken of the subject, I have, as far as opportunity served,



endeavoured to ascertain the morbid appearances that occurred in the several forms of laryngeal disease, and, connecting them with the symptoms which I have observed, or which have been described by others, I have come to the following conclusions :—

1st. Assuming, as a general principle, that where alteration of the natural structure of the part has taken place a recovery must be impossible, I wish the surgeon to avoid all unprofitable interference with such cases.

2. As we know that in almost every instance of chronic disease in which the parts have not undergone that alteration already alluded to, a cure may be effected by active medical treatment, I would have every reasonable effort of this nature made, consistently with the safety of the patient.

3d. I have endeavoured to point out those cases in which the operation of bronchotomy is our only resource—to shew that it must be resorted to not as an “ultimum remedium,” but early in the disease, and with a view to avoid incurable morbid actions—and to prove that, in the event of delay, both the lungs and brain suffer so much in consequence of obstructed respiration, as to render a recovery impossible.

How far I have succeeded in explaining these facts, it is not for me to determine ; but as I know from experience that these forms of disease are not sufficiently understood,—as I have witnessed the vacillating opinions and undecided practice which are exemplified whenever any of these cases occur,—as I have seen the utmost uncertainty prevail amongst men of high pro-

fessional attainments even in the treatment of common croup, together with the greatest anxiety to ascertain the nature of the disease by subsequent dissection, I may at least venture to express a hope that this little work will prove serviceable to surgical students, a class of persons for whom it is only intended, and for whose instruction it was originally undertaken.





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THE END.











